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FEBRUARY 1935

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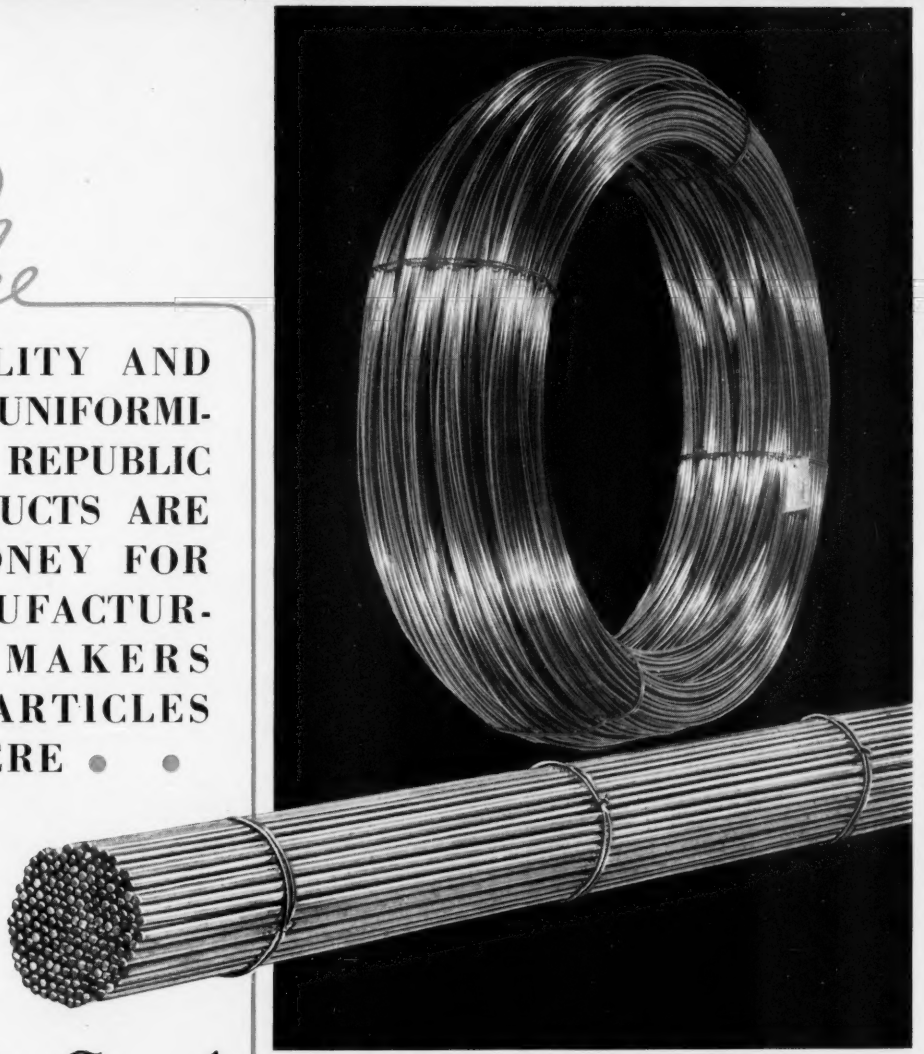

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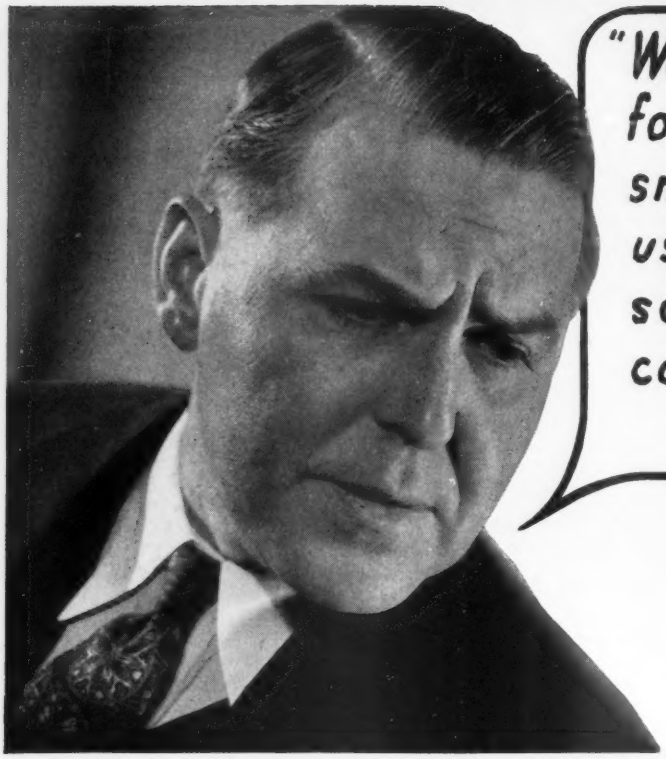

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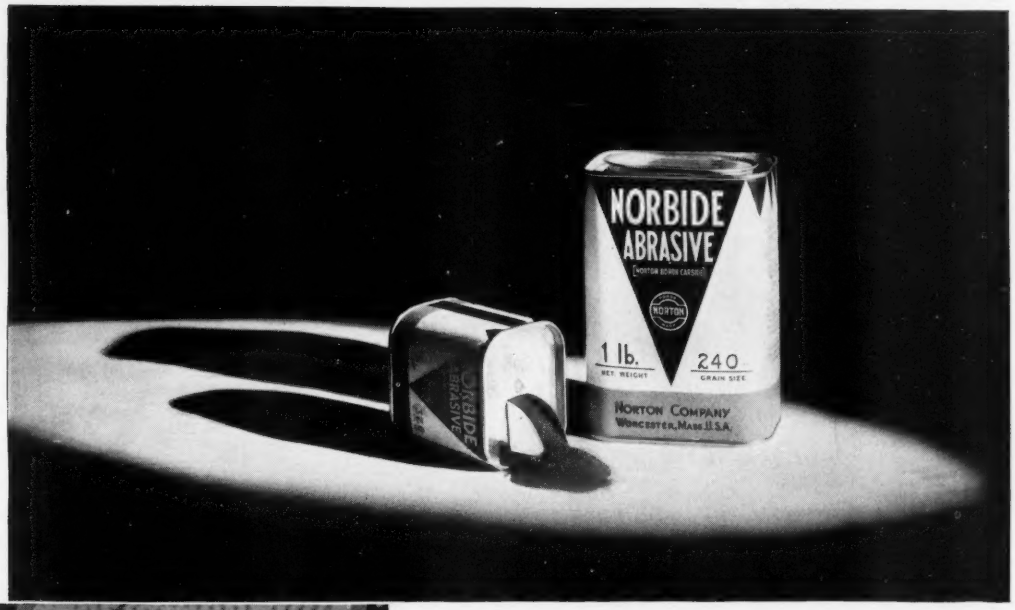

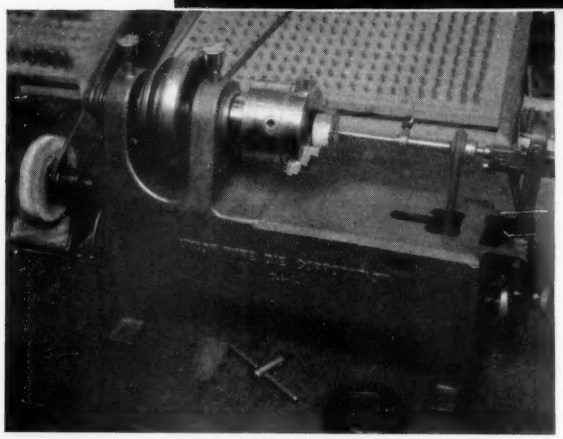

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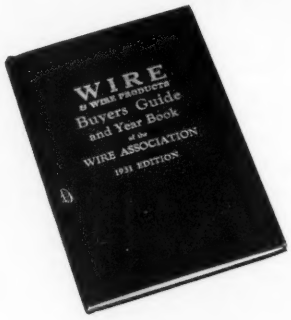

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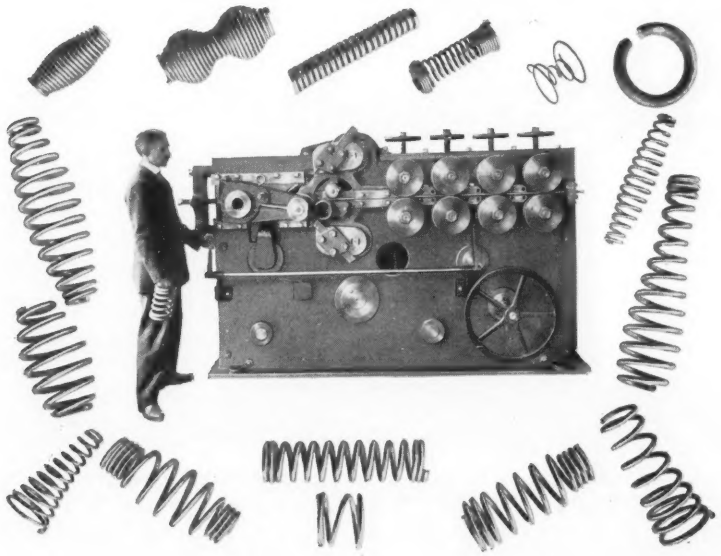

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire Products and Insulated Wire and Cable.

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 10 February 1935 No. 2

Designated as

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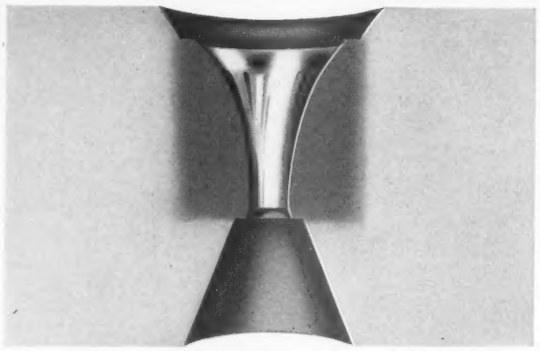

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 10 | February 1935 | No. 2

The Story of Wire

By Captain Frank W. Bullock

Signal Corps, U. S. Army

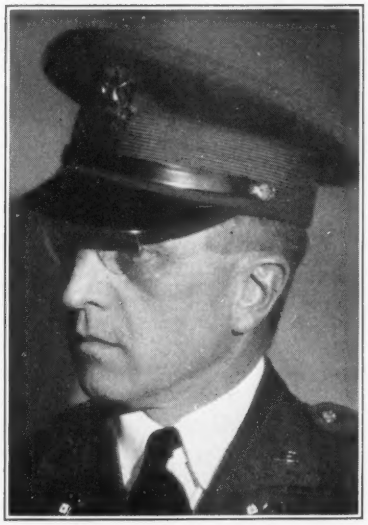
A survey of the origin and development of the wire industry, together with an analysis of the conditions creating wire products markets and a ten-year forecast on the future of the wire industry. An original research presented to the Harvard Graduate School of Business Administration. Part I.

Wire in Everyday Life

THE effect of wire and wire products upon our civilization and national progress is difficult if not impossible to estimate. If one were to allow his imagination to run free, it is entertaining at least to speculate on how much the late George Washington would have enjoyed the friendly rays of an electric heater in his primitive headquarters at Valley Forge, or wonder if perhaps the outcome of the operations at Waterloo might not have been different if Napoleon could have talked to his Marshals over the field telephone.

✦ ✦ ✦

TURNING to the ladies, as they have been served by wire, so have they profoundly influenced the development of the wire industry. Every changing style of dress from hoopskirts on, has directly or indirectly affected the wire industry. During the crinoline era, for example, two mills in Worcester, Mass., produced over 1500 tons of hoop skirt wire in a single year. And don't forget bustles, bonnets, stays, hair pins, hooks and eyes, and the infinite variety of ornaments for dress and hat which represent requirements for wire and wire products which both for variety and tonnage are rather impressive.



FRANK W. BULLOCK
Captain Signal Corps, U. S. Army
Graduate "High Distinction"
Harvard Graduate School of Business Administration.
(Member of the Wire Association)

✦ ✦ ✦

WIRE has become an indispensible element in our modern every day life. Should this assertion seem exaggerated, suppose we look in on Mr. Average Citizen, as he passes through his daily routine.

✦ ✦ ✦

AS the first rays of the morning sun filter through the wire screen which protects his window, he is probably rudely awakened by the shrill call of an alarm clock. And what is that alarm clock? A case made of flat wire, containing an assembly of wheels and gears stamped from flat wire, pinioned and driven by flat wire springs. Even the bell may be a piece of flat wire pressed into shape, add to these the hands, stamped from flat wire and behold, our clock, save for the paper dial is made entirely of wire—and even the paper depended on wire for the making.

✦ ✦ ✦

THE bedclothes he throws back have all been made of fiber, carded with wire and woven on machines made largely of wire. In going to the window he finds the shade held in place by brackets of flat wire, and regulated by a coiled

Designated as Official Publication by the Wire Association

wire spring concealed inside the roller. He crosses a floor fastened down with wire nails and opens his bathroom door which swings on hinges equipped with wire pintles, and which latches with a rim lock operated by wire springs.

✦ ✦ ✦

THE stems of the bathtub faucets are wire, and even the soap has been cut into its convenient shape by wire cutters. His towels are the product of a Jacquard loom, a most marvelous collection of wire needles and drop wires. Every article of clothing he puts on was manufactured through the use of wire, the clasp of his Boston garter is made of wire, as is the buckle on his belt. The metal tips of his shoe laces are stamped from flat wire, and so are the eyelets in his shoes. Fastening his collar with buttons pressed from wire he adjusts his wire tie clip and goes in to breakfast, prepared on utensils made principally of wire, and addresses his attention to the morning paper—printed on newsprint paper made by the use of wire.

✦ ✦ ✦

IT is needless to follow our mythical John Citizen throughout the day, but whether he travels to his place of business in a snooty Rolls Royce or a humble flivver, or joins the proletariat in the El, or subway, wire makes his trip possible. The concrete highway over which he travels is reenforced with wire, and the elevator that shoots him to his office floor is raised and lowered with wire ropes. The electric fan and telephone in his office, the buzzer which summons his secretary and the complicated mechanism of her typewriter are principally made of wire. All through the day Mr. Citizen finds himself served by wire and wire products.

✦ ✦ ✦

AT home after dinner he settles down to enjoy the Radio, an instrument made of wire and served by wire, and when he at last turns off the wire-connected electric light by means of a wire spring actuated switch, he drops off to sleep on a form-fitting, innerspring mattress to dream of "the age of wire".

Origin and Early History of Wire

ALTHOUGH most of us have forgotten the major portion of our high school geometry, one thing we do recall, namely that it takes three points to determine the position of a line. Similarly it takes three points of observation to determine the economic position of a mechanical craft or an industry, the past, the present, and the future. The future is, of course, outside our range of vision, but if we can reach back far enough into the past, we can, by observing the present, figuratively sight over two points and lay a fairly accurate course into the future.

✦ ✦ ✦

THE origin of wire, and the art of fabricating wire into articles of use and ornament is beyond the range of recorded history, unless we say that the history of man's early progress toward civilization is itself written in wire. In other words, the progress of civilization may be traced by observing the development of man's skill in fashioning metals into wire. Unfortunately the sources of information concerning the early history of wire manufacture are both scanty and disconnected, and the beginning of the Story of Wire is at best only an attempt to piece together the scattered bits of written evidence and the few examples of primitive wire that have survived the passage of time.

✦ ✦ ✦

Wire--3745 B. C.

ONE of the earliest examples of the use of wire in ornamentation is a crown dating back to about 3745 B. C. C. L. Wooley, in "Ur of the Chaldees" tells of his discovery of the crown and describes it as made up of wire leaves. He also tells of the discovery of the body of Queen Shubab of Samaria, and expresses surprise at finding heavy rings of gold wire twisted in her wig. A necklace found at Dendarab in Egypt, bearing the name of an Egyptian Pharaoh who reigned about 2750 B. C., was made in part of gold wire. One of the earliest written references to wire occurs in the Bible (Exodus XXXIX:3).

"And they did beat the gold into thin plates, and cut it into wires, to work it in the blue, and in the purple, and in the scarlet, and in the fine linen, with cunning work."

✦ ✦ ✦

THERE is authentic evidence of the use of wire in Assyria and Babylon as early as 1700 B. C. Both Homer and Pliny refer to the use of wire in connection with woven or embroidered golden textiles.

✦ ✦ ✦

Wire Rope--800 B. C.

BUT there is evidence that ancient man had other uses for wire than the adornment of his person. In the Kensington Museum there is a piece of wire rope, made in Ninevah in about 800 B. C. It is not the familiar type of twisted or *laid* rope, but a bundle of parallel wires bound together with stout bands of wrought metal (not so much different from the mighty cables which support the George Washington Bridge over the Hudson). In the museum at Naples, there is a piece of bronze wire rope, excavated from the ruins of Pompeii, composed of three strands twisted together. During the Dark Ages and in the early Middle Ages, craftsmen began to tdapt wire to the making of armor and weapons. Coats of mail were laced with wire, and secured with wire rings and buckles, helmets were stitched with wire, and crossbows were strung with wire. The chain mail worn by the Christian knights in the Crusades gives evidence of having been made of links fashioned from cold drawn wire.

✦ ✦ ✦

Non-Ferrous Wire

THE materials from which the earliest examples of wire in existence were made were the nonferrous metals, gold, silver, copper and their primitive alloys. It is probable that the ease with which these metals could be worked both hot and cold had much to do with their selection for wire making for ornamental purposes. There is, however, no evidence that the use of iron in making wire did not appear at as early or perhaps earlier times. The fact that there remain

no examples of primitive iron wire might be explained by the fact that iron deteriorates faster than the non-ferrous metals. There is ample evidence that iron was smelted and used contemporaneously with the development of the so-called bronze age. It is reasonable to assume that ancient craftsmen did not overlook the potential usefulness of iron in the form of wire.

✦ ✦ ✦

Development of the Art of Wire Making

Early Wire Was Not Drawn

IT is generally believed by historians that wire made prior to the Christian Era was not drawn through dies. Such wire as has survived has been carefully examined and shows some traces of the manufacturing process. Some of it was sheared from plates and rounded by beating with a hammer. Some was sheared from thin sheets and twisted; some was made by rolling up a scroll of thin sheet, pointing it down and pulling it through tapering holes in order to roll the scroll tight. In no case is there evidence of elongation by cold working, nor does such wire appear in lengths exceeding a few inches. When longer wires were required, short pieces were brazed or soldered together.

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The Wire Drawing Die

THE earliest known reference to the wire drawing die in literature is found in a Latin manuscript written about the year 1000 A. D. The writer, Theophilus, mentions dies as a part of the usual equipment in a metal working shop and describes them as being two or three fingers wide, rather thin, and pierced with two or three rows of tapering holes. Since he offers no description of the wire drawing process it may be assumed that wire drawing was a process already well known to metal craftsmen. Dies of this sort, found in deposits of tools and weapons believed to have been left by the Vikings, indicate a knowledge of cold drawing as early as 700 to 800 A. D. A crude die, fashioned from an irregular lump of iron has been found in France, alleged to date back to the third century. The weight of evidence, except for the Theophilus manuscript, strongly supports the contrary opinion that in the year 1000 the die was still something of a novelty.

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Progress in the Art

IN any event the art of wire drawing was apparently well established by the year 1000 and during the next 400 years acquired a fairly prominent place in contemporary literature. The art itself, however, made but slow progress. In the year 1350 a certain German ironmaster, one Rudolph of Nuremburg, hit upon the idea of applying power to the drawing of wire. His process was a jealously guarded secret and the records of that time show that he made a great fortune by it. His competitors finally got hold of his idea by bribing his son to describe to them the process, which was, as set forth in the ecclesiastical Latin records of the town of Nuremberg, "The drawing of wire by the labor of wheels". In reality Rudolph's idea was not much of an improvement. Tools and processes remained entirely unchanged; the product was still as crude and rough as that made by hand—only mechanical power replaced a part of the human labor. To illustrate how slowly the art progressed it is interesting to refer to a description of the art of wire drawing written in 1760, four hundred years after Rudolph's revolutionary invention:

"One can see how the work is done by the weight of the wheels and with what great power they stretch the iron and how they perform what a thousand men could not do before this art was discovered. A great wheel driven by the force of water, drives with itself a powerful shaft whose surface is armed with many teeth and when this shaft is turned by the water power, these teeth push and drag with them the parts of the machine which, although they resist, are unable to withstand the terrific force of the shaft, the wheel and the water. The dragons (tongs) seize with their sharp teeth the raw iron and smooth it to round wire which is taken out of the dragon's mouth and coiled into a thousand convolutions."

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ALTHOUGH written in the year 1760, this quotation would pass for a faithful description of the process of Rudolph of Nuremberg. Four hundred years seem to have brought only negligible improvement in wire-drawing equipment.

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Coating and Lubrication

VERY little is said in early accounts of wire making, about the very important matter of coating and lubrication of the wire in draft, and there is ground for belief that such treatment played little or no part in the process. Birringuccio refers to wax as a coating but seems to believe that it was used only to preserve a bright color on gold and brass wire. It must be borne in mind that coarse wire was in very short pieces, was drawn in extremely light drafts and was annealed after no more than three reductions. Such wire was also deeply scored every two or three inches with grip marks and a few scratches more or less were of little consequence. Coarse wire had no commercial value except as raw material for fine wire which was still a hand-made product. Apparently the failure to lubricate wire in draft made little difference under the conditions as they then existed.

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IT is believed, on good evidence, that the idea of coating wire prior to drawing had occurred to no one prior to 1650. Wire bars, forged by hand, were freed of scale by scouring with stone and sand. Annealed wire was cleaned the same way and went direct to the die carrying more than a little grit. In 1650 a revolutionary discovery was made. It seems that while iron wire was being successfully drawn to fine gauges and was coming into extensive use for wool cards, fish hooks, mousetraps, etc., steel could not be reduced through the die. This did not point to any lack of appreciation of what steel wire would be worth, for many at-

tempts were made to draw it. The story is told of a German wire drawer at Altena who became so disgusted with an obstinate batch of steel wire that he tossed it out of the shop window in a rage. It landed in a marshy bit of ground, in the tall weeds behind a privy. A few days later the master discovered it there, where it had collected a dirty brown scum on its surface. As a punishment for the drawer's carelessness, the master ordered him to draw it as it was. Much to everyone's astonishment the steel drew beautifully as the result of the first sull coat ever given a wire. It was a great day for Altena. The secret of drawing steel wire had been discovered. For a hundred years this secret was kept in the Altena district and all steel wire was coated in exactly the same way as the original sample. A writer of that period speaks of the wives and children of the wire drawers going to the mills at noon carrying yokes over their shoulders, one end bearing the lunch bucket, the other a bucket containing the family contribution to the art of sull coating. About 1750, after 100 years of experiment, it was found that dilute sour beer would produce a sull coat. After another hundred years it was discovered that water would do just as well.

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Purpose of Lime Coat

THIS sidelight on the history of wire coating furnishes some clue to the nature and purpose of the lime coat as used today. It was generally believed in the early days that the lime coat was used to neutralize acid. As a matter of fact a poorer neutralizer for sulphuric acid could hardly have been selected. Moreover, the lime coat came into general use at a time when mineral acids were not used as cleaning agents. Even today there is little knowledge of the real purpose and value of the lime coat. It is probable that although it has no lubricating value of its own, lime acts as a carrier for lubricants which are too soft to stand the enormous pressures generated in the die. The sull coat probably serves the same purpose, but with the demand for bright finished wires the sull coat is passing into disuse.

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Cleaning

CLEANING, for a thousand years, was a purely mechanical operation, in fact until about 1730 it was entirely a hand operation and was not generally displaced by chemical treatment until after 1860. The general adoption of sulphuric acid as a cleaning agent may be attributed to three factors. First there was a growing demand for coarse wire as a finished product, free from the scratches which were tolerated in a semi-finished product and in longer length than were required for further working. Second, improved rolling methods produced rods in bundles too large for economical cleaning by mechanical means. Finally, the period from 1845 to 1860 brought into the American market a relatively cheap supply of sulphuric acid which appeared as a by-product of the copper sulphide ores which began to be treated in the early 1850's. The adoption of acid pickling was slow and even twenty-five years ago, the practice was by no means universal.

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Annealing

ANNEALING is perhaps the most backward element of the wire making art. Prior to 1920, annealing practice showed little improvement over the most primitive methods. Since the great war, the science of metallography, aided by microphotography and X-ray studies of metals has caused heat treating to become the most important influence on the art of wire making and it will undoubtedly play a dominating role in the future technological development of the wire industry.

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Drafting Practice

DRAFTING practice has from the beginning been governed almost entirely by the personal skill of the drawer. No improvement in machinery and equipment has effected any appreciable transfer of skill to the machine, with the result that today wire making stands as the highest form of metal craftsmanship.

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Development of the Die

CONCERNING the development of the wire drawing die, accurate historical and scientific knowledge is almost completely lacking. Like drafting practices, the slow improvement in the design of dies has come almost entirely from the skill of the wire drawer. During recent years, however, the drawing die has become the subject of serious scientific study and the future may bring forth some revolutionary innovations. Already the cemented ferro alloys (tungsten and tantalum carbides) have made for themselves an important and permanent place in the development of the cold drawing art. At the same time the growing knowledge of heat treating applied to drawing dies has added materially to the efficiency of the familiar chilled iron and steel dies. The die still has a long distance to travel before it approaches the limit of its possible usefulness. There is a pressing need for a successful formula for analyzing the forces operating in the die, to separate drawing tensions into their components, and determine how much of the energy applied to the metal is wasted in die friction and how much actually performs useful work in deforming the metal. Once the true properties of the die are known, the field of its useful application will acquire new and perhaps undreamed of horizons.

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Part II of this article will be published in the March issue of Wire & Wire Products.

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Some Hazards In Wire Mill Operations

By Richard E. Brown

Some protective devices for accident prevention in wire mills, illustrating the work of the National Safety Council in the development of accident prevention in wire mills. ✦ ✦

THE subject of accident prevention in wire mills is one which should be of great interest to all operating men.

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IN discussing this matter recentcently W. D. Speight, Manager of the Employment Department of the Keystone Steel & Wire Company Peoria, Illinois, describes some of the hazards from wire operations in his plant.

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HE classifies the eye hazard as "the most important of all hazards in the wire working industry. In 1925," he continues, "we lost four eyes in the wire mill. We put in goggles in 1926 and operated almost five years without a lost eye. There have been but two lost eyes in the last eight years."

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"ANOTHER hazard in wire drawing is due to loops in wire or rods which appear on the way between the reels and the die stand. Occasionally a wire drawer will step into a loop. This usually results in a bad injury to leg or foot. We had one man seriously injured about a year ago when a loop dropped over his head and caught him about the waist. The loop hazard is being eliminated in new installations by moving the reels farther back from the machine. The longer the distance between the reels and the blocks, the less chance there is for loops."

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PHOTOGRAPH No. 1 pictures a scene where a man was killed. It is a typical wire drawing bench, going out of existence in favor of the continuous machine. "However", continues Mr. Speight, "we are still using this bench and I think most wire mills still have this type of bench in service. Wire drawing has always been considered the most hazardous of work in a wire mill. The man who was killed at the block shown in the foreground (photo No. 1) had blocked the safety arm with a die (shown in the photo) rather than to call the millwright and have repairs made. The block would not stay in gear for some reason and the safety arm would 'kick out'. By blocking the safety arm the block would stay in gear and operate. His glove caught in the wire at the block, he was jerked against the safety arm which being blocked with the die could not move. The purpose of the safety arm is, of course, to shut off the block by throwing it out of gear, when anything strikes it. This man was thrown against the safety arm with such force that he bent it (the upper end) over and then was dragged on around the block and over the bench until a fellow workman stopped the entire bench with a safety rope which cuts off the power."

Photo No. 1. Man blocked safety arm with die instead of calling millwright. Keystone Steel & Wire Co. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

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PHOTOGRAPH No. 2 shows a common hazard in any industry — handling objects and "Dropsy". For four consecutive years we have had more toe and foot accidents than finger and hand accidents. Safety shoes have aided us materially in this. The man in the picture actually dropped a keg of nails about two feet above his toes and escaped injury although the nails made a dent in the safety cap of the shoe.

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PHOTOGRAPH No. 3 shows an accident thermometer installed at a gate office. It was a painted enlargement of a

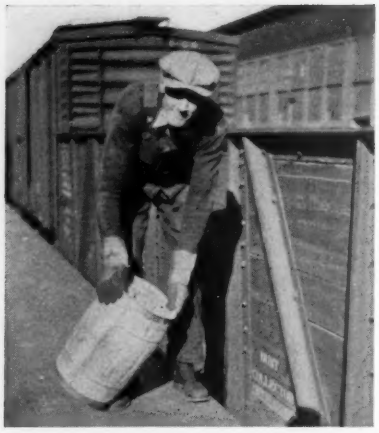

Photo 2. Safety shoes saved a foot accident when keg dropped two feet—Keystone Steel & Wire Co. ✦ ✦ ✦ ✦

poster put out by the National Safety Council. This is the line of safety education and the eternal hammering that must be done by every plant to keep the minds of employees on their accident prevention program.

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JOSEPH W. LOVELL, Safety Director of the Collyer Insulated Wire Company, Pawtucket, Rhode Island reports for his company that the most prevalent kinds of plant accidents with which they must contend are hernias and infections. Toward meeting the hazards from infections they try to impress upon their employees the need of prompt attention to cuts and other injuries. Among their mechanical accident prevention devices they have established safety stops on their old type rubber mills. Also, employees are instructed to report all accident hazards which they may observe.

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THEIR company safety organization centers around their foremen, who instruct their workers. It was their plan formerly for all foremen to meet monthly for dicsussions of manufacturing methods and safety problems. All serious accidents are investigated, to place responsibility and to control accident causes. When new employees start work they are trained in safety methods by their foremen. Plant interest in safety is maintained through the posting of up-to-date safety posters, and through urging all employees to attend the regular city safety meetings conducted by the Blackstone Valley Safety Council.

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AS a result of this program Mr. Lovell reports that the number of accidents among company employees have steadily declined during the past six years, with the exception of the year 1933 when there was an increase in accidents over the previous year.

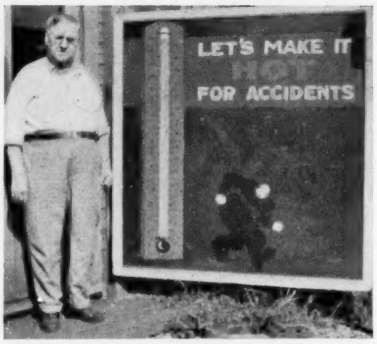

Photo 3. Accident thermometer at a gate office—Keystone Steel & Wire Co. ✦

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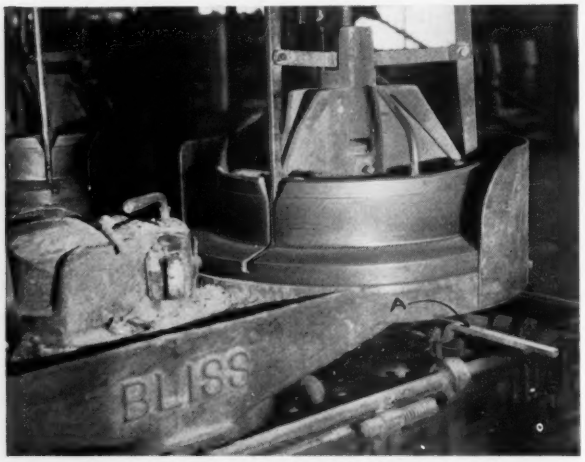
VERNON C. KING, Safety Supervisor of the Wickwire Spencer Steel Company, in discussing accident prevention states "Wire drawing, and spring making especially, is rather a hazardous business and, a few years ago, our record at this plant was far from what it should have been. About 1925, it became necessary to make a change in the superintendent of this plant and Mr. Fred Connor



AUTOMATIC POWER CUT-OUT

Photo 4. Bar "A" is on the back of the Wire Drawing Machine. If a man should become caught by wire approaching the machine, the moment he touched this bar, the power would be cut off, and machine stopped. ✦ ✦ ✦ ✦ ✦ ✦ ✦

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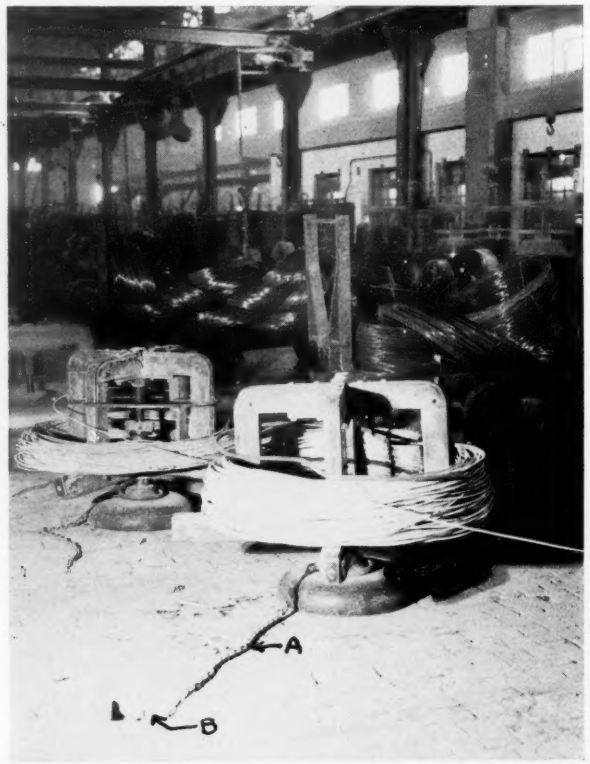

AUTOMATIC POWER CUT-OUT

Photo 5. Spool carrying rod being fed to Wire Drawing Machine. If spool stops revolving and is pulled out of place the Chain-A pulls plug connection B loose, shutting off power from Wire Drawing Machine. ✦

Youngstown Sheet & Tube Co.

was appointed to this positon. He was a man fully sold on the idea of accident prevention and was determined that the record of his plant should be as near perfect as possible, and from this time on, the accident experience steadily improved. Mr. Connor is now District Superintendent but his ideas of safety were so carefully implanted in his organization and in the mind of his successor that their record has continued to improve, in spite of the fact that no very great improvements have been made in any of the equipment."

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"IN a plant of this kind many of the accidents consist of minor cuts and scratches. The fact that these do not develop into septic cases is accounted for by the diligence of our nurse in charge of First Aid work. She has been so thorough in looking after this phase of accident prevention that the employees do not have to be urged to take care of these minor injuries which so many times develop into serious cases.

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"THIS is not a very large plant so that it is possible for the supervisors to be in pretty close contact with all of the workers which is an important item in preventing serious accidents. We do not have many safety meetings and use only a few bulletins, but each month all of the supervisors are supplied with a copy of the 'Safe Worker' in which they are all interested and use to good advantage."

"I feel that the one thing responsible for this record more than anything else is the personal interest of each and every one of the supervisors at this plant."

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WHAT seems to be the most outstanding accident prevention record up to date concerns the experience of the Western Clock Company, La-Salle, Illinois, which, employing 2300 people, recently passed the ten million "accident-free" hour mark: On Monday, December 17th the third consecutive year was finished without an accident serious enough to keep the victim from work the day following his injury.

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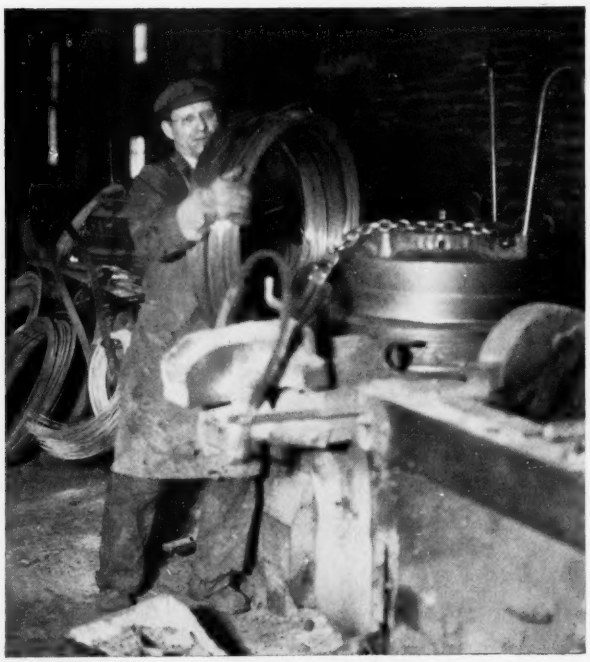
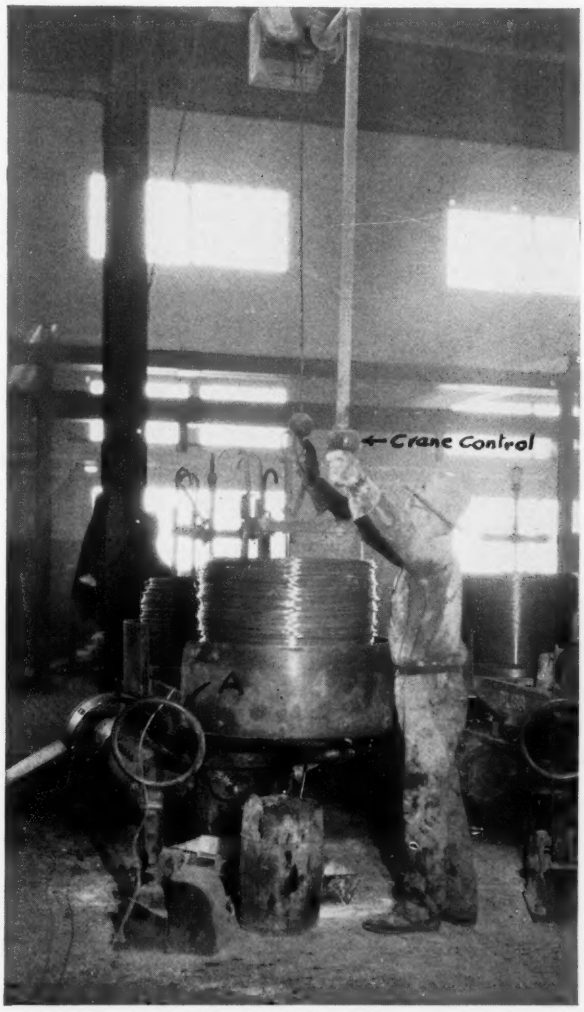
IN this company you will find a "Central Safety Committee" made up of six men. The present personnel is: Wayne Hocking, Employees' Service Department and Acting Secretary of the Committee; Adam Currie, Superintendent's Office; Wm. Kemper, foreman of the Power Press Department; Dudley Diggs, foreman of the Maintenance Department; Robert

(*Please turn to page 81*)



REMOVING WIRE FROM WIRE DRAWING MACHINE
Photo 6. Old Method—Brute Strength.



REMOVING WIRE FROM WIRE DRAWING MACHINE
Photo 7. New Method—Floor Operated Crane. Note control of crane in operator's left hand.

AUTOMATIC POWER CUT-OUT
Note where rod approaching Wire Drawing Machine through ring "A". If rod cobbles, or becomes entangled, the cobbled or entangled mass strikes the ring, pushing it over and cutting off the power stopping the machine.
Youngstown Sheet & Tube Co.

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Weatherproofing of Telephone Wires

By W. J. Lally

Member of Technical Staff, Bell Telephone Laboratories, Inc.,
New York, N. Y.

The development and manufacture of "drop" wires together with a description of weatherproofing processes and testing methods. ✦ ✦ ✦

IN the pioneer days of the telephone industry, distribution was effected by the use of a single galvanized iron wire extending from the central office to the subscriber's station, the return circuit being through ground. The wires for the various subscribers were grouped on pole lines extending along the streets and highways, and at each subscriber's premises a wire was "dropped off", i.e., extended from the pole line to the subscriber's house or business establishment. Thus the wire extending from the main distribution line to the subscriber's premises early came to be known as a "drop".

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WITH the growth of the industry and particularly with the advent of the metallic return system, the number of wires required became so great that space limitations and the matter of appearance made the development of a more compact system of distribution essential. These service demands resulted in the development of the early types of multi-pair cable, and of a special wire for "drops".

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Early Drop Wires

THE earliest drop wire was a twisted-pair wire with 14-gauge hard-drawn copper conductors, each of the conductors being rubber-insulated and covered with a weatherproofed braid. A 17-gauge copper-clad steel conductor was later substituted for the larger copper conductor, the steel providing the requisite strength and the copper, the necessary conductivity. Subsequent major changes in drop wire have been the adoption of a bronze alloy as a conductor material for the 17-gauge size, and the development of a parallel-type of wire in which the two rubber-insulated conductors, untwisted, are placed within a single weatherproofed braid. At the same time many important though less obvious improvements have been effected in the rubber insulating compounds and weatherproofing materials.

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Effect of Rubber Compound Deterioration

RUBBER compounds deteriorate under the influence of sunlight, or other light rich in ultraviolet, due to oxidation stimulated by the actinic rays. This deterioration is exhibited by a tendency of the rubber to crack, the failure commonly being termed "sun-cracking". Weatherproofed braid inhibits this type of failure by serving as an interposing screen between the rubber and the source of light, at the same time shielding the rubber from the oxygen of the air. In addition, it provides protection against abrasion and other mechanical injury.

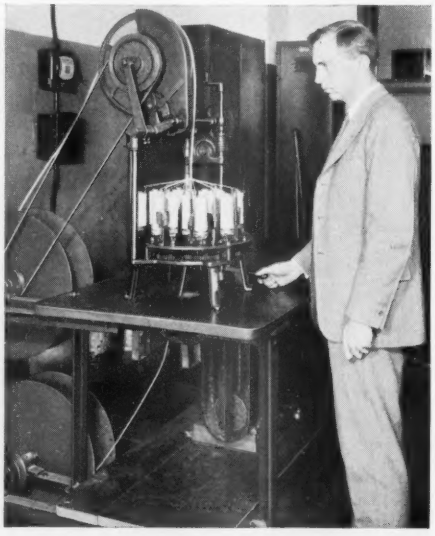

Fig. 1. A braiding machine used for preparing test samples of drop wire. ✦ ✦ ✦

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The Manufacture of Drop Wires

IN the manufacture of a drop wire the conductors are first drawn to size and are then provided with a coating of tin, which serves the dual purpose of protesting the conductor from corrosive attack by the sulphur in the insulating compound, and of protecting the latter from the deleterious influence of the copper and its salts. Over the tinned conductor is extruded a covering of rubber insulating compound. In the modernized process developed and used by the Western Electric Company at its Point Breeze Works for the manufacture of rubber-insulated wire, the extrusion and vulcanization of the insulating compound is a continuous operation. In the manufacture of parallel drop wire by this process, the two conductors are insulated simultaneously and are joined together by a fin of rubber compound. The fin facilitates the duplex extrusion and serves to hold the two insulated conductors together during the early stages of manufacture, thus

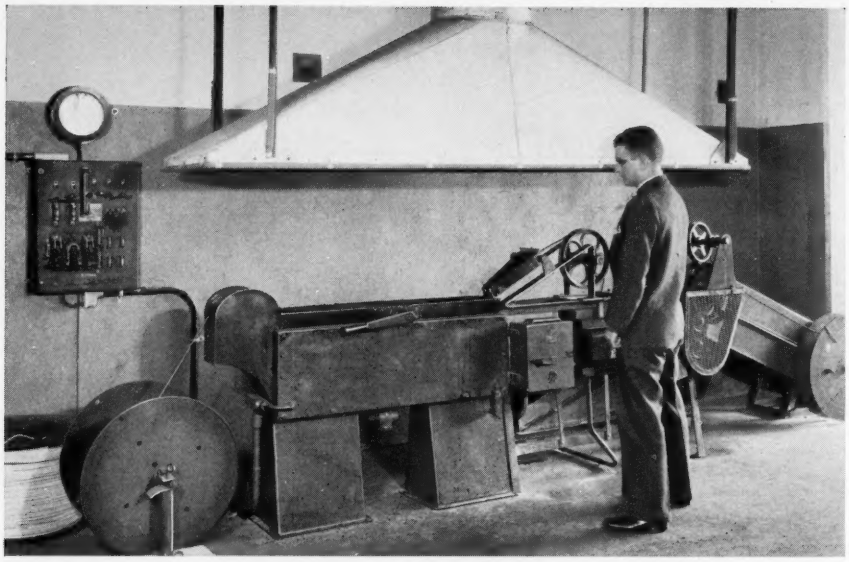

Fig. 2. Braided wire passes through a tank of impregnating compound and then through powdered mica to form a hard, non-sticking outer coat. ✦ ✦

eliminating the necessity for a subsequent pairing operation.

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Braiding

AFTER vulcanization, the two insulated conductors are covered with a single cotton braid which subsequently is weatherproofed. The braid used for the greater part of the weatherproofed wire employed in the telephone plant is formed from a flat multiend strand of two ply unbleached cotton yarn. For wire intended for use where numerous tree contacts cannot be avoided, however, a harder braid of hawser cord, formed by cabling several threads of cotton yarn with a fairly tight twist, is used to provide the greater resistance to abrasion required by this type of service.

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Weatherproofing

THE weatherproofing employed by the Bell System for its outside distributing wires comprises thorough saturation of the cotton braid with a crude-oil, asphalt, and montan wax compound, subsequent application of a continuous smooth coating of stearine pitch over the saturated braid and, lastly, application of a coating of ground mica to the surface of the pitch-finished wire. The saturant used resists migration at high summer temperatures well, and the stearine pitch forms a tough adherent coating which is highly resistant to abrasion and to weathering. The coating of mica which is applied over the stearine pitch serves principally to prevent sticking between adjacent convolutions of the wire when the wire is coiled, although some improvement in abrasion resistance is effected by its use, and it also serves to reflect some of the incident sun's rays.

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BECAUSE of the large quantity of drop wire used by the Bell System and the desirability of securing as long a life for it as is economically practicable, studies of all materials used and of the various processing steps are being continually carried on. Facilities are available at Bell Laboratories for carrying out all the steps in applying the protective coatings and for testing the finished product under accelerated conditions.

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Testing Materials

A BRAIDING machine, shown in Figure, I, permits braids of various types and of different materials to be applied to test specimens of insulated wire. In this way it is possible to study the effect of employing various types of constructions and of the large variety of possible materials. For applying braid saturants and outer coatings, the apparatus shown in Figure 2 is employed. The braided wire is taken from a reel on the left and passed through a tank containing the saturating compound, which is maintained at a suitable temperature. After the braid has been saturated with the asphalt compound, the wire may be again passed through the same machine but with the tank filled with stearine pitch. On emerging from the

Fig. 3. Inspecting a rack of samples of weatherproof wire from the artificial weathering apparatus. ✦ ✦ ✦ ✦ ✦ ✦

pitch the wire is passed through wiping dies to remove the excess, and then into a box containing powdered mica while the pitch is still warm and viscous. After leaving the mica box the wire passes through water-cooled rolls which imbed the mica in the pitch and at the same time cool the wire to prevent adjacent turns from sticking together on the take-up reel.

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Gauging Worth

SINCE the outer braid is employed to protect the rubber both from the effects of sunlight and of abrasion, two pieces of testing apparatus are employed to gauge its worth. One is the artificial weathering device shown in Figure 4. This is a heat insulated cabinet equipped with an electric heater with automatic control for maintaining any desired temperature up to 200° F. Water nozzles are provided to produce rain spray, and mercury arc lamps to provide ultra-violet radiation. Refrigeration facilities for subjecting the samples to reduced temperature cycles are arranged in a separate unit.

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Testing Abrasion Resisting Properties

THE equipment for testing the abrasion-resisting properties of wire finishes has two rotating aluminum-alloy wheels, the periphery of each of which is recessed to hold fifty samples of wire. Held against the samples on each wheel by a constant spring pressure is a furrowed hard-maple strip which serves as the abrader. The device is equipped with a counting mechanism for recording the number of times that each sample passes the abrader. The number of rubs required to wear through the weatherproofed braid to the rubber insulation is used as the index of the abrasion resistance of the sample. This test stimulates the effect of tree limbs rubbing against a wire, and permits rapid evaluation of the resistance of a wire to deterioration under service conditions.

Fig. 4. Abrasion testing machine for wire braids.

Test Results

IN the continual search for improved weatherproofing materials, these facilities are of great value. Figure 5 is illustrative of the type of information obtained with the accelerated weathering device. The two samples of drop wire shown in this photograph have been exposed to artificial weathering for a period of two months. Sample I is the present standard drop wire, weatherproofed as described in an earlier paragraph; sample II is the same type of wire, but weatherproofed in accordance with the practices in effect prior to adoption of the present standards. The two-month exposure to the artificial weathering cycle is estimated to be equivalent to three years of exposure to natural weathering. It will be noticed that the present standard wire (Sample I) still has a substantial coating of weatherproof finished compound, whereas the cotton braid of the other wire is almost completely exposed. Prior to the weathering test, both samples were coated with essentially the same thickness of weatherproofing materials.

Fig. 5. Samples of old and new type weatherproofing after two months of artificial weathering.

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DATA obtained from abrasion tests show that while the present standard wire requires from 56,000 to 66,000 rubs to wear through the braid, the former coatings would wear through in from 3,500 to 19,000. This improvement in abrasion resistance becomes particularly significant when it is considered that abrasion alone is responsible for something like half the total trouble in the drop wire plant.

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A Correction

AT the conclusion of the article entitled "Fifteen Generations in the Wire Industry" which was published in the January issue of WIRE & WIRE PRODUCTS, there was an editorial note stating that Mr. Highley, the subject of the article, died at his home in Pittsburgh since the article was written. This was an error as Mr. Highley is still very much alive and on the job.

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MR. DAVID OLIVER, however, whom the article referred to died just prior to the publication of the article.

Reels And Spools Standardization

Reprints of the report of this committee as published in the November, 1934, issue of WIRE & WIRE PRODUCTS, outlining the proposed new standards for reels and spools for insulated wire and cable can be obtained for 25c a copy.

The Pickling Solution For Rods

By William M. Lease, Jr.

Head Pickler, Wire Mill, Bethlehem Steel Co.,
Sparrows Point, Md.

A brief outline of the cleaning house and the effect of its proper operation on the elimination of scrap. ✦ ✦ ✦

AS all wire manufacturers know, the Cleaning House is the very heart of the Wire Mill; and unless every precaution is taken and every attention is paid to this department, there will be endless trouble in the subsequent processes, and tons of steel will be reduced to scrap. At present, there is much comment and research development going on.

✦ ✦ ✦

Ideal Pickling Agent

ALL metallurgists agree that the immersion of steel in acid is a very undesirable treatment, and extreme care in such an operation is necessary; and it is essential for the economic removal of oxide scale from steel which is to be cold worked afterward. Obviously, the ideal pickling agent would be a substance which removes the scale without attacking the steel; and although such a pickling agent has not yet been found, some approach to it has been made by the addition of inhibitors or restrainers to the pickling solution. The inhibitors used are organic and colloidal and are by-products of refinery operations such as acid liquor from benzol washing plants, and have a strong affinity for the hydrogen developed in pickling. Commercially, they are manufactured in both powder and liquid form.

✦ ✦ ✦

Action of Inhibitor

WHAT the exact action of the inhibitor is, is difficult to explain; but the following is the concensus of opinion at present, at least from the layman's point of view. The rolling mill scale to be removed is only slightly soluble in acid, but it is very porous and allows the acid to penetrate to the steel which dissolves rapidly with evolution of hydrogen. The escaping hydrogen lifts the scale and leaves the surface of the clean metal exposed. At this point the inhibitor acts, depositing a colloidal film on the exposed metal and retards further attack on the steel for as long a time as an hour, depending upon the analysis of the steel. Even when the scale is uneven in thickness the thin parts are cleaned first, and the steel thus cleaned is not further attacked, while the thick scale continues to be removed until the whole surface is cleaned.

✦ ✦ ✦

The Chemist's View

THEN, of course, we have the point of view of the chemist. A prominent chemist* states that "the instant the acid acts on the iron two atoms of nascent hydrogen are liberated. These atoms transfer their charge to the iron and immediately combine to form a molecule of hydrogen gas. The hydrogen gas escapes up through the pickling solution, and it is the removal of this gas which keeps the chemical reaction going always in this direction. When inhibitors are employed, the organic compound is reduced by the two positively charged atoms of nascent hydrogen. The hydrogen evolved does not form a hydrogen molecule, but is eliminated. By eliminating the molecule of hydrogen gas the reaction is stopped, or since this reaction depends on the formation of the hydrogen molecule and the removal of the hydrogen gas, it cannot take place. Hence there is no attack on the steel as long as the inhibitor is present in any appreciable amount."

*W. G. Imhoff.

✦ ✦ ✦

Advantages of Inhibitors

THE advantage of using inhibitors are of course many. It saves acid; there is practically no attack on the steel, thereby eliminating loss of weight in the tub; a good clean surface is obtained; a very thorough pickling assured without damage to the steel; and very little hydrogen embrittlement occurs due to the occluded hydrogen.

✦ ✦ ✦

Disadvantages of Inhibitors

THERE is one disadvantage. All inhibitors seem to break down at temperatures around 190° F., so that just the time when the inhibiting quality is needed most, it fails completely. When using a "spent" tub, when the iron content is high and the acid content is becoming lower, it is necessary to run at temperatures of 190° F. to 200° F. and at this point the inhibitor breaks down.

✦ ✦ ✦

Kinds of Inhibitors

THERE are two kinds of inhibitors, foaming and non-foaming. The non-foaming seems to be the most advantageous as far as economy is concerned, because the

(*Please turn to page 82*)

The Manufacture of Welding Electrodes

By Francis A. Westbrook

Consulting Engineer, Center Conway, N. H.

A discussion of the use of variable speed control units in the manufacture of welding electrodes by Maurath, Inc., and an outline of the economies resulting therefrom. ✦ ✦ ✦

MAURATH, INC., of Cleveland has made use of variable speed control units very extensively in the manufacture of metallic electrodes of various sizes and different materials, and has realized marked economies in doing so. The following brief description of the process of making the electrodes will show how the variable speed units are used on the machines involved, and will also be suggestive of what can be done to them with respect to speed control in other processes.

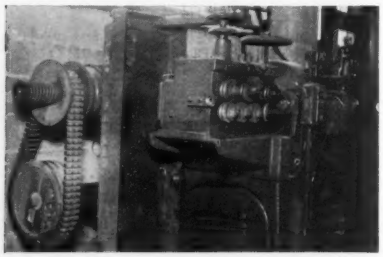


Fig. 1—Wire Straightener. ✦ ✦

✦ ✦ ✦

Straightening and Cutting

THE electrodes are made from wire which comes in coils of different lengths and diameters. The first step in the manufacture is to straighten the wire and cut it into lengths of 18". This is done in the wire straightener shown in Fig. 1, through which the wire is passed and cut into the required lengths. All types of wire cannot be cut by drawing it through the straightening rolls at the same speed because of differences of drawing temper and this of course determines the rate at which the pieces are cut. Actually the production of the machine varies between 60 and 120 pieces per minute in practice. This is controlled by means of a variable speed motor pulley in the drive between the individual motor and the machine.

✦ ✦ ✦

Grinding of Burrs

AFTER this the pieces of wire are taken to the grinding machine where burrs and foreign material are removed so as to provide a smooth, clean electrode to receive the coating of flux. The efficient speed of this operation depends upon the diameter of the wire, as of course electrodes of different sizes are produced. That is, wire 3/16 in. in diameter can be handled at the rate of 140 pieces per minute, while that of 3/32nd in. diameter can be run through at 240 pieces per minute. This process is shown in Fig. 2. The motor is in the foreground and the variable speed control unit by means of which the speeds are controlled at any desired rate between the above limits, is shown next to it.

(*Please turn to page 83*)

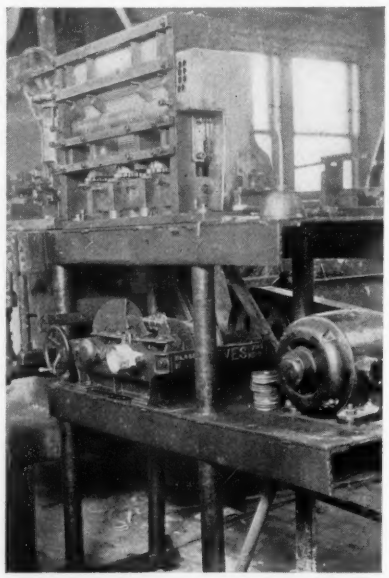


Fig. 3—Coating the electrodes. ✦ ✦

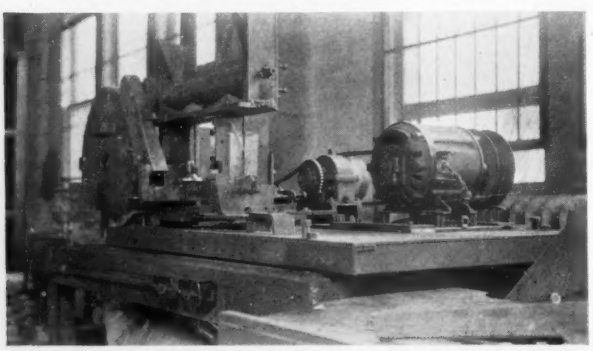


Fig. 2—Grinding-off Burrs. ✦ ✦ ✦ ✦ ✦

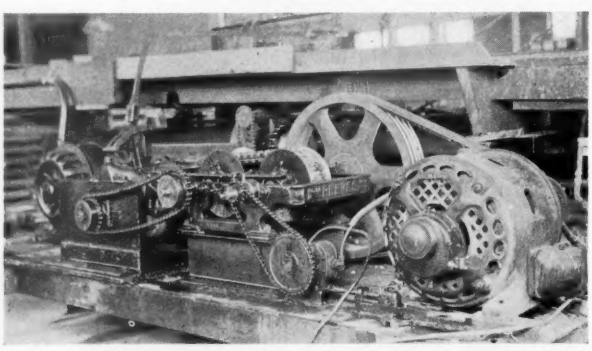
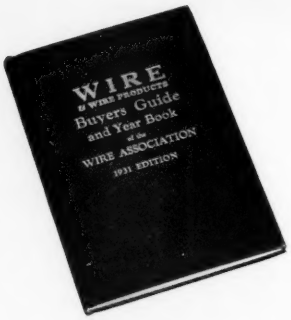


Fig. 4—Controlling rate of flow of the flux through the die cylinder.



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✦ ✦ ✦

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Plant Supt., ...

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EXAMPLES OF TYPICAL HEADINGS SHOWING STYLE OF ADVERTISEMENTS AND BOLD FACE LISTINGS

WIRE—Bolt

American Steel & Wire Co., 208 S. La Salle St., Chicago, Ill.
Atlantic Wire Co., Branford, Conn.

Bethlehem Steel Company
BOLT WIRE, NAIL WIRE, RIVET WIRE, STAPLE WIRE
Bethlehem, Pa.

BETHLEHEM STEEL CO., Bethlehem, Pa.
CONTINENTAL STEEL CORP., Kokomo, Ind.
JONES & LAUGHLIN STEEL CORP., 3rd & Ross Sts., Pittsburgh, Pa.

COLD HEADING WIRE
J&L STEEL
Wide range of grades and finishes, for cold forming of cap screws, bolts, rivets, etc.
JONES & LAUGHLIN STEEL CORPORATION
JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA

KEYSTONE STEEL & WIRE CO., 3000 Industrial St., Peoria, Ill.
Pittsburgh Steel Co., Union Trust Bldg., Pittsburgh, Pa.
REPUBLIC STEEL CORP., Republic Bldg., Youngstown, O.
Seneca Wire & Mfg. Co., Fostoria, O.
YOUNGSTOWN SHEET & TUBE CO., Youngstown, O.

MACHINERY—Rolling Strip, Cold Iron & Steel

BRODEN CONSTRUCTION CO., 10255 Harvard Ave., Cleveland, O.
Conran, Fred'k M., 107 Colden St., Newark, N. J.
FARREL-BIRMINGHAM CO., INC., 37 Main St., Ansonia, Conn.

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Wire Drawing -- Single and Multiple Drafting

By Richard Saxton,
Sheffield, England

Some principal wire drawing machines in use in Great Britain and a discussion of the effect on quality and the variation in depth of deformation and stresses set up by different drawing methods. ✦ ✦ ✦

SINGLE draft draw blocks, the first and in the opinion of many manufacturers the best for producing quality material, still retain premier place for the production of high tensile steel and alloy wires. The introduction of the continuous machine as an improvement on the single draft dry drawing method may be termed a recent innovation, for it was not until 1900 that the first machine to successfully draw two drafts at one operation was placed on the market.

✦ ✦ ✦

THIS machine, which furnished ideas for many later improvements, was what is termed the two-decker type, and consisted of two drums mounted on one spindle. Whilst a success in production of mild quality wire, variation of drafting was limited, and care had to be exercised that size essential on lower drum was not exceeded, any increase leading to an accumulation of material too great for upper drum to take up before lower was filled.

LATER experiments developed the separate drum type and made possible the reduction of 6 drafts and higher at one operation. As the capabilities of continuous machines became better known it was found that the four-draft system gave best service, and this was adopted generally.

✦ ✦ ✦

FIG. I. illustrates two types of single draft machines universally employed in Great Britain for the drawing of high tensile rope wire, No. 482, a frame of four single drafters, being employed principally in the production of shape and locking wires. Due to stout construction of drum and gearing, breakdowns or replacements are few, and many of these machines have a record of over 50 years continuous service.

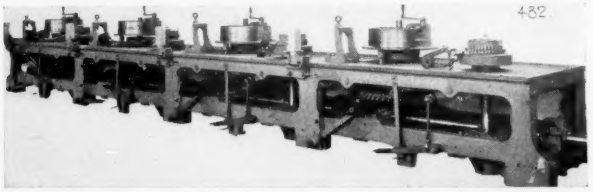
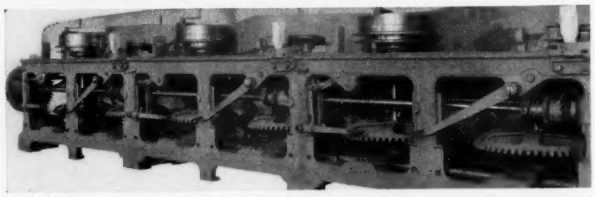


Fig. 1, No. 482—A frame of four single drafters, employed preliminary in the production of shape and locking wires. ✦ ✦ ✦



No. 551—Latest form of double decker type used principally in roughing or breaking down 0.45 and 0.65 carbon, patented wire. ✦ ✦

NO. 500 is an illustration of a friction drum-drive machine popular for the drawing of high tensile cylindrical wires. The pull-in gear is of the capstan or drum type, one pull only being necessary to draw sufficient length to insert in draw vice.

✦ ✦ ✦

NO. 551 is the latest form of the double-decker type, employed principally in roughing or breaking down 0.45 to 0.65 carbon, patented material, whilst Fig. 3 shows design of one of the latest types of four drafting continuous machines, each drum being mounted on a separate spindle.

✦ ✦ ✦

THIS last type with its separate propulsion for each drum conforms in principle to the single draft machine, thus enabling a wider range of drafting to be employed without overloading any particular drum. Each is driven by a separate motor and coupled to this by special reduction gear, stopping and starting being performed by the pressing of a foot control.

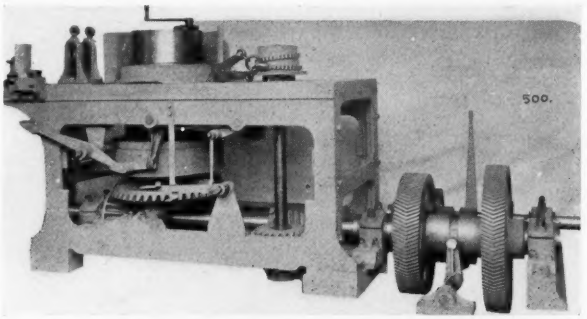


Fig. 1A, No. 500—Friction drum-drive machine for drawing high tensile cylindrical wires. ✦ ✦ ✦ ✦ ✦ ✦

✦ ✦ ✦

WITH this machine it is possible when end of coil has run off first or roughing drum, to thread up and start a second coil

without stoppage of reduction operation taking place on first, and threading can be continued as each drum becomes empty. This saves time wasted with older type when waiting for clearance of drums. A further feature is automatic trip switches, which automatically switch off power immediately tension on wire becomes excessive.

✦ ✦ ✦

WHILST reduction process in both methods when drawing cylindrical material is practically similar, effect on quality with equal depth of deformation per draft is variant, transverse stresses set up being greater in the continuous method. The effect in single drafting is, per draft, a modification or slight elongation of the crystals, whilst interval elapsing before subjected to succeeding draft enables grain structure to recuperate from stresses imposed.

✦ ✦ ✦

THE continuous method with its lesser intervals between drafts, imparts to the material a harder nature, thus depth of deformation per draft must be less. Steel, particularly high carbon material, is most susceptible to fatigue when undergoing plastic deformation by cold work, and in this condition is brittle and resistant to further reduction.

FATIGUE can be imparted in the single draft method and is caused by subjecting to succeeding draft immediately on finishing drawing. Whilst rarely found in mild steel where reduced single draft, it is the practice when drawing high carbon material to draw 6 to 8 coils before proceeding with the next draft. This method of providing a rest interval eliminates to a certain extent any tendency to this defect without curtailing production.

✦ ✦ ✦

THOUGH continuous drawn mild material is of good quality in its class, and efficient for majority

Fig 3.

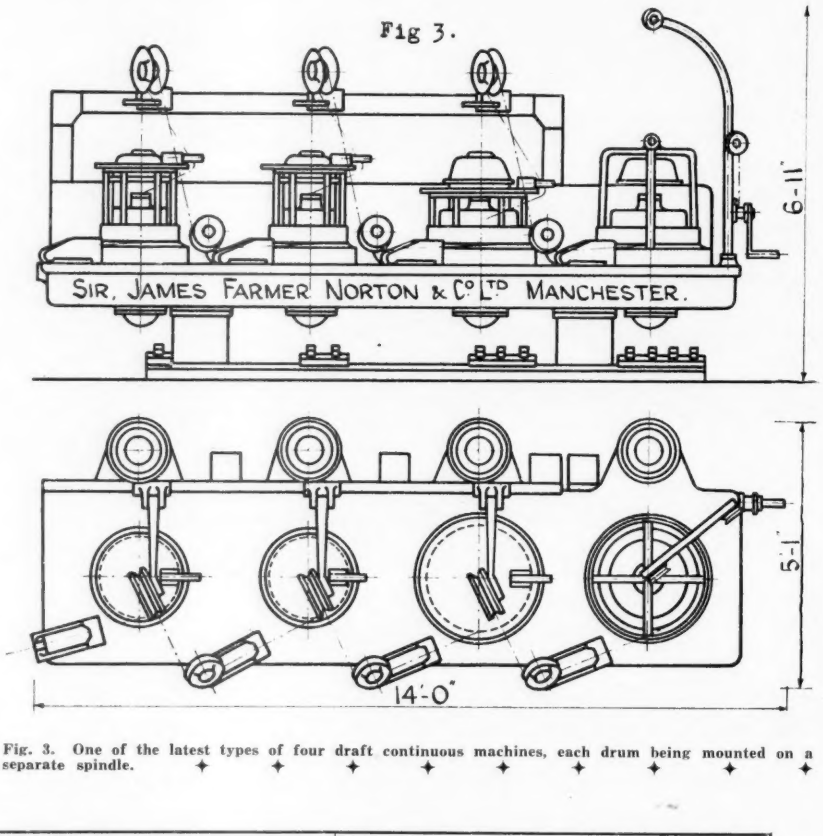


Fig. 3. One of the latest types of four draft continuous machines, each drum being mounted on a separate spindle. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

DRAWING STAGES FOR MILD STEEL.							ACTUAL PRODUCTION IN 10 HRS.		
WIRE INLET.	DRAFTS.						FINISHED WIRE SIZE.	SPEED IN FT./MIN.	PRODUCTION. LBS.
	1	2	3	4	5	6			
.212″	.172″								
.212″	.172″	.144″					.144″	500	10600
.212″	.172″	.144″	.116″				.116″	500	7920
.212″	.172″	.144″	.116″	.092″			.092″	640	6720-7250
.212″	.172″	.144″	.116″	.092″	.080″		.080″	640	3970-4410
.212″	.172″	.144″	.116″	.092″	.080″	.072″	.072″	640	3090-3420

With 12 H.P. Motor the speed may be increased to 720 feet per minute.

For **High Carbon Steel** up to .7% the speed is reduced to 330 feet per minute, with approximate drafts as under:—

Inlet, .212″, .184″, .158″, .130″, .114″, or heavier drafts depending on degree of hardness of wire.

of purposes for which manufactured, the extra stresses set up by the more rapid reduction result in a material of a less malleable nature than when reduced to equivalent size by single drafting. Higher production however, where malleability is not the main essential, makes the adoption of this method an economic proposition, for with a four drafter in operation with all drums employed, there is approximately 400 per cent increase in production compared with the single draft machine.

✦ ✦ ✦

WHILST, as stated, output equals 400% increase when all drums are employed, in actual practice it amounts to approximately 250 per cent, difference or loss being due to time taken in threading preparatory to starting, and to drums running empty whilst wire is winding on last or finishing drum.

✦ ✦ ✦

MILD steel of approximately 0.10 to 0.25 carbon presents little difficulty in reducing 6 drafts, roughly about 10 sizes, but carried beyond this point without intermediate annealing quickly results in a condition known as "overdrawn."

✦ ✦ ✦

IN this condition it is of little service, and whilst restored by annealing, overdrawn material does not respond to further plastic deformation with the same facility as material in which this condition has been obviated.

✦ ✦ ✦

AN advantage in single drafting is that, if desired, greater latitude in depth of deformation is possible, and this facility is employed by the operator when drawing high tensile material to increase or decrease reduction in order to finish to specifications.

✦ ✦ ✦

TORSIONAL properties, claimed by many rope makers to be more important than tensile stress, can also be better controlled or imparted by this ability to vary drafting, whilst possibility of fatigue condition can be avoided by an efficient drawing programme.

THE action taking place in crystalline structure during passage through die is similar in both processes of reduction, with the exception that the more rapid hardening of the metal in the continuous method produces a finer grain. It is possible in the continuous to produce a grain structure similar and equal to that of the single method, but the greater number of drafts essential renders project an uneconomic proposition.

✦ ✦ ✦

EFFICIENT flow of metal is dependent on size and uniformity of grain structure, and finer the grain, greater the resistance to elongation. Inversely, a coarse grain unassociated with ingotism or overheating, has a greater capacity to elongate or reduce. Crystalline structures of granular or cellular sorbite are the most suitable for reduction as in wire drawing.

✦ ✦ ✦

FLOW of metal during wire drawing is caused by circumferential pressure induced by the pull, and where taper of bearing is at correct angle rapid flow of crystals at centre is countered by extra pressure on outer grain structure. Due to uniform incidence of the applied pressure cylindrical shapes respond easiest to reducing operation. Shapes other than cylindrical cannot be drawn by the continuous method, irregularity of cross-section preventing from following into succeeding die at correct angle to ensure efficient production.

✦ ✦ ✦

VARIOUS opinions exist as to flow, one being that this is uniform throughout section, whilst a second maintains that core commences to lag immediately pressure is applied, thus producing greater flow in outer section.

✦ ✦ ✦

A THEORY recently advanced is that in reducing wire in cylindrical form, convergence of pressure on centre results in greater elongation of fibres at this point, with resultant increased loss of ductility. At dead centre crystals are under heaviest pressure from all sides, and it is inferred that this extra pressure induces the fatigue condition previously described.

✦ ✦ ✦

ACCORDING to Adams‡, the result of the pressure is to so arrange the crystals that there is a rhombic dodecahedral plane perpendicular to the length of the wire, and a cube face lying in the surface at all points.

✦ ✦ ✦

THE lighter the drafting, the greater the aggregate reduction which can be performed without intermediate annealing before reaching overdrawn condition, but lighter drafting necessitates extra plant, and in drawing to specified tensile test larger diameter in commencing size, thus rendering process uneconomic.

✦ ✦ ✦

THE question as to whether combined pressure at centre sets up a condition of fatigue which, whilst latent under rapidly applied strain as in tensile testing is revealed by fracture at a lower stress in normal working conditions, is one which has been the subject of controversy, for wires passing tensile and torsion test satisfactorily have been observed to fail when worked in rope formation.

✦ ✦ ✦

FATIGUE is considered by many manufacturers to be the principal defect to which material is liable during drawing of high tensile wire, for where absent in the raw material or rod it is easily set up by too rapid reduction or heavy deformation, and unless revealed by fracture in earlier stages remains undetected until material is in finished condition.

✦ ✦ ✦

THOUGH as previously stated, heavy deformation is a contributory factor, too rapid reduction is the chief cause of this defect, and it is wise practice to employ slowest speed possible in drawing consistent with efficient production.

✦ ✦ ✦

THE practice of drawing or roughing about 6 coils in first

‡"Wire Drawing & Cold Working of Steel." (H. F. & G. Witherly, London.)

(*Please turn to page 85*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Nov. 1934 and Nov. 1933
(In gross tons)

	Nov. 1934	Oct. 1934	Nov. 1933
Wire rods	3,710	483	2,062
Hoops, bands and strip steel	2,027	1,646	1,974
Plain black or galvanized iron or steel wire	2,034	2,988	2,870
Barbed wire and woven wire fencing	2,570	3,117	3,173
Woven wire screen cloth	64	56	36
Wire rope	212	257	372
Other wire and manufactures	337	286	253
Wire nails	1,044	887	984
Tacks	46	34	58
Other nails, including staples	215	261	185
Bolts, machine screws, nuts, rivets and washers	424	394	357
Total, these 11 classifications	12,693	10,409	12,324

Imports of Iron and Steel wire Products Into The United States
(In gross tons)

Concrete reinforcement bars	101	17	479
Hollow bars and drill steel	43	60	118
Merchant steel bars	1,696	1,456	2,026
Wire rods	880	231	778
Barbed wire	294	365	389
Round iron and steel wire	209	159	458
Telephone and telegraph wire	1		
Flat wire and strip steel	216	151	150
Wire rope and strand	60	213	163
Other wire	64	62	125
Hoops and bands	1,840	1,739	1,682
Nails, tacks and staples	488	367	651
Bolts, nuts and rivets	29	19	26
Total, these 13 classifications	5,921	4,839	7,045

Exports

PURCHASING United States' iron and steel products to the extent of 56.7 percent of the aggregate tonnage shipped during November, the Far East continued as the leading overseas market, this proportion remaining the same as October participation. European participation in November increased from 14.9 percent in October to 24.3 percent and placed that area in the position of the second market of importance, while the share of North and Central America and the West Indies declined from 17.2 percent during the previous month to 12.6 percent. South America was the fourth area of importance, purchasing 4.9 percent of the total shipped during the month under review, a drop of 4.6 percent under October participation. African participation rose from 0.8 percent in October to 1.5 percent of the November trade.

✦ ✦ ✦

JAPAN remained the chief individual outlet on a tonnage basis, 153,751 tons of United States' iron and steel products going to that market during November. The principal products moving in this trade were scrap, 144,648 tons—29,248 tons higher than shipments made during October, wire rods, 3,114 tons, ingots, blooms, billets, slabs and sheet bars, 2,859 tons, tin plate 2,056 tons, and black steel sheets, 651 tons. The United Kingdom was the second market with purchases aggregating 25,278 tons of which scrap, 24,616 tons, predominated. Canada—the third market—covered a more varied trade, including in its share of 24,350 tons—scrap, 3,793 tons, black steel sheets, 1,774 tons, plain shapes, 1,559 tons, steel bars, 1,440 tons, hoops, bands, and scrolls, 786 tons, ingots, blooms, billets, slabs and sheet bars, 765 tons, "other plate", 625 tons, and cold rolled strip steel, 595 tons. Italy's participation to the extent of 23,258 tons included 22,453 tons of scrap, and 756 tons of black steel sheets, while the purchases of Poland and Danzig were wholly of scrap, 14,827 tons. The sixth market was Mexico with total purchases of 6,482 tons chiefly made up of black steel sheets, 1,243 tons, tin plate, 723 tons, car wheels and axles, 593 tons, scrap, 583 tons, and cast iron pressure pipe and fittings, 510 tons.

✦ ✦ ✦

Imports

REGISTERING 35,272 gross tons, imports of iron and steel products into the United States during November increased by 15,070 tons—75 percent—over the October trade, and represented the largest tonnage for any month since March of this year. The gains and losses in individual classifications — when compared with the previous month—were rather widely separated, increases being recorded in 20 items as against losses in 11 while in 3 classifications no trade whatever occurred during the two months under review. The marked rise in receipts of ferromanganese and spiegeleisen, 8,636 tons, was more than sufficient to turn the import trend upward, and constituted the most pronounced increase in the month's trade, while a sharp increase was also registered in scrap imports (5,597 tons), with other increases of moment occurring in structural shapes, 682 tons, steel ingots, blooms, etc., 312 tons, and merchant steel bars, 240 tons. Pig iron receipts continued to drop and the 627-ton loss represented the outstanding decrease in the November import trade, followed by rails and rail fastenings, 258 tons, sheets, skelp, and saw plate, 230 tons, welded pipe, 170 tons, and wire rope and strand, 153 tons.

✦ ✦ ✦

FERROMANGANESE and spiegeleisen was the principal product received on a tonnage basis, the 10,826 tons received coming chiefly from Canada, 9,428 tons, Norway, 1,261 tons, and the United Kingdom, 115 tons. Scrap—7,606 tons—was next in importance and was supplied chiefly by Canada, 7,554 tons, while pig iron ranked third with a total of 6,055 tons originating chiefly in the Netherlands, 2,539 tons, British India 2,201 tons, Canada, 740 tons, and Sweden, 376 tons. In this report covering the October trade, it was stated that pig iron to the extent of 3,500 tons had been received

(*Please turn to page 79*)

A Review of Recent Wire Patents

No. 1,982,630, METHOD OF WIRE BINDING, Patented December 4, 1934 by Jesse A. Bent, Los Angeles, Calif., assignor of one-third to S. Q. Shannon and one-third to Lolita M. Hinds.

Particularly, this method is adapted for banding hose ends with wire so as to clamp hose ends to couplings, bushings and the like.

✦ ✦ ✦

No. 1,982,784, SUBMARINE CABLE, Patented December 4, 1934 by Oliver E. Buckley, Maplewood, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

In the construction of this submarine cable, the armor wires and the return conductors are so proportioned that each of them carry a considerable share of the return current.

✦ ✦ ✦

No. 1,982,941, SPRING ASSEMBLY, Patented December 4, 1934 by William E. Wunderlich, Muncie, Ind., assignor to The Moore Company, Muncie, Ind., a corporation of Indiana.

The invention lies in the provision of a spring interconnection, which is stated to be strong and noiseless and adapted to prevent relative displacement of the individual springs with reference to each other.

✦ ✦ ✦

No. 1,983,249, WIRE ROPE AND METHOD OF MAKING THE SAME, Patented December 4, 1934 by Charles C. Sunderland, Trenton, N. J., assignor to John A. Roebling's Sons Company, Trenton, N. J., a corporation of New Jersey.

It is stated that wire inequalities are prevented from traveling from one section of the rope to another by this method which comprises helically forming some of a number of the wires, laying unformed wires about a central core and then laying the helically formed wires loosely about the unformed wires.

✦ ✦ ✦

No. 1,983,563-4, INSULATED ELECTRICAL CONDUCTORS, Patented December 11, 1934 by Beauford H. Reeves, Pine Orchard, Conn., assignor to Rockbestos Products Corporation, a corporation of Mass.

These conductors are stated to be particularly adapted for low voltage power lines. In the first, the inventor aims to protect the electrical conductor from actual contact with the arc extinguishing agent, such as urea, associated therewith by admixing with the urea a starch containing substance capable of increasing the cohesion between the particles of urea at temperatures above the melting point of that substance.

In the second patent, the inventor provides a conductor having a hollow core filled with asbestos and impregnated with an arc extinguishing compound such as the ammonium alydes.

✦ ✦ ✦

No. 1,983,764, METHOD OF COVERING WIRES, THREADS, AND FILAMENTS WITH RUBBER COMPOSITION, Patented December 11, 1934 by Frederick Henry Lane, Evelyn William Madge, and Edward Arthur Murphy, Birmingham, England, assignors to Dunlop Rubber Company Limited, London, England, a British corporation.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

In this method, the wire filament is drawn upwardly through the surface of a coating material to form a coating on the surface of the wires after which the coating is exposed to a coagulating medium, the exposure being such as to coagulate and set the dispersed particles of the coating sufficient to resist distortion and sticking.

✦ ✦ ✦

No. 1,984,038, ELECTRICAL CABLE AND CORD, Patented December 11, 1934 by Gilbert B. Shaw and Earl G. Sturdevant, Bristol and Carleton W. Short, East Providence, R. I., assignors, by mesne assignments, to United States Rubber Company, New York, N. Y., a corporation of New York.

The construction of this electrical cable is such that the two conductors may be separated, with their insulation coating adhering thereto and without loss of the insulating material.

✦ ✦ ✦

No. 1,984,553, FLEXIBLE ELECTRIC CONDUCTOR, Patented December 18, 1934 by Horace A. Staples, Plainfield, N. J., assignor to Phelps Dodge Copper Products Corporation, New York, N. J., a corporation of Delaware.

The core of this conductor comprises an open, longitudinal, seamed tube having edges of the seam turned inwardly to form abutting flanges so as to prevent the tube from collapsing under circumferential compression.

✦ ✦ ✦

No. 1,984,554, HOLLOW CABLE, Patented December 18, 1934 by Horace A. Staples, Plainfield, N. J., assignor to Phelps Dodge Copper Products Corporation, New York, N. Y., a corporation of Delaware.

The central portion of this cable comprises a number of tubes of conducting material stranded together upon which a flat metallic ribbon is placed helically with a pitch less than the standing pitch of the tubes so that a large flat surface is provided to support the outer conducting layer. It is claimed that with this construction the outer layer will lay without caging or bunching.

✦ ✦ ✦

No. 1,984,555, FLEXIBLE ELECTRIC CONDUCTOR, Patented December 18, 1934 by Horace A. Staples, Plainfield, N. J., assignor to Phelps Dodge Copper Products Corporation, New York, N. Y., a corporation of New York.

The core of this conductor comprises a continuous wire of helical conformation, formed into circular loops at periodic intervals, the axis of the loop and the axis of the helix substantially coinciding.

✦ ✦ ✦

No. 1,984,721, ELECTRICAL COIL WINDING DEVICE, Patented December 18, 1934 by Bismark C. Beitling, San Fernando, Calif.

This is described as an improvement upon the inventor's prior device disclosed in U. S. patent 1,948,875 granted February 27, 1934. It is claimed that the later device will wind the coil with a greater degree of exactness.

✦ ✦ ✦

No. 1,984,742, ROD OR WIRE STRUCTURE FABRICATING MACHINE, Patented December 18, 1934 by Otto Hauck, Donora, Pa., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

This machine is adapted for manufacturing crossed wire structures, the machine progressively securing the wires together at their points of crossing.

✦ ✦ ✦

No. 1,985,020, MULTICOIL SPRING STRUCTURE, Patented December 18, 1934 by Rudolph Coopersmith, St. Louis, Mo.

This inventor provides a flexible strip for the purpose of fastening associated coil springs together, the strip being bent into a loop formation and having a pair of openings to receive the ends of the coil spring.

✦ ✦ ✦

No. 1,985,771, COATED WIRE CLOTH, Patented December 25, 1934 by Arthur Eichengrun, Charlottenburg, Germany, assignor to Celanese Corporation of America, a corporation of Delaware.

This wire cloth is made of organic derivatives of cellulose and at least one halogenated aliphatic phosphoric ester selected from the group consisting of tribromethyl phosphate - trichlorbutyl phosphate.

THE WIRE ASSOCIATION—

What It Will Do For YOU—

THROUGH membership in the Association you will be able to exchange ideas with the best minds in the industry; you will be able to have puzzling technical questions on production answered for you; you will receive the benefits of the research work conducted by the Association for its members.

✦ ✦ ✦

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17 E. 42nd St.,

New York, N. Y.

Outstanding Personalities of the Wire Industry

Ernest Koenig, Chief Engineer of Republic Steel Corporation

ERNEST KOENIG has been appointed chief engineer of the Republic Steel Corporation.

✦ ✦ ✦

MR. KOENIG has had extensive experience in the iron and steel industry. He is a graduate of Carnegie Tech, Pittsburgh, and has been associated in engineering capacities with the Youngstown Sheet & Tube Company and the Carnegie Steel Company, at the Ohio Works.

✦ ✦ ✦

J. H. Vohr, Superintendent of New Strip Mill of Youngstown Sheet & Tube Co.

JOHN Henry Vohr, newly appointed superintendent of the continuous hot wide strip mill of the Youngstown Sheet & Tube Company, was formerly assistant superintendment of a similar mill for the Inland Steel Company, in the Chicago district. He has been with the Sheet & Tube Company assisting in installation of the new strip unit.

✦ ✦ ✦

MR. VOHR served the American Sheet & Tin Plate Company as master mechanic at Farrell, Pa., and later in a similar capacity at Gary, Ind. He is a graduate of Cornell University.

✦ ✦ ✦

C. H. H. Weikel Appointed Manager of Bethlehem Steel Research and Development

C. H. H. WEIKEL has been appointed manager of the commercial research and industrial development department of Bethlehem Steel Company, effective immediately.

✦ ✦ ✦

MR. WEIKEL has been connected with the steel industry since 1912, having started his business life with the frog and switch department of the Pennsylvania Steel Company at Steelton, an organization which subsequently became a part of the Bethlehem company.

✦ ✦ ✦

HE continued at Steelton, with experience in the steel foundry,

DAVID REES BOWEN

maintenance and order departments until the war.

✦ ✦ ✦

FOLLOWING the war he joined the accounting department at Bethlehem in 1919 and six years later he became associated with the legal department, with special duties in respect to development and research.

✦ ✦ ✦

HE has been associated with the sales division since 1930, where he has given particular attention to industrial planning and market extension.

✦ ✦ ✦

J. B. Montgomery Appointed General Manager Youngstown Pressed Steel Co.

THE Youngstown Pressed Steel Co., announces the promotion of two officials. Joseph B. Montgomery, Jr., has been made general manager of the entire plant. He was formerly general manager of sales. M. C. Summers was advanced to assistant general manager and office manager.

✦ ✦ ✦

THE Youngstown Pressed Steel Co., a subsidiary of the Sharon Steel Hoop Co., Sharon, Pa., and has its plant at Warren, Ohio.

✦ ✦ ✦

Earl C. Smith to Deliver Howe Memorial Lecture

EARL C. SMITH, Republic Steel metallurgist, will deliver the Howe Memorial lecture at the annual meeting February 20th of the Mining and Metallurgical Engineers' Institute, to be held in New York. He will read a paper entitled "Some Studies of Problems in Steel Melting."

✦ ✦ ✦

David Rees Bowen

DAVID REES BOWEN, vice-president of Farrel-Birmingham Company, Inc., and for forty-five years its chief engineer, died at his home at Ansonia, Conn., on Saturday, December 29, 1934.

✦ ✦ ✦

MR. Bowen was born in Cwmavon, Wales, October 22, 1865. He received his early education in the British National Schools and at Llandovery Collegiate School. At the age of 17 he came to the United States with his parents and and 1883 entered the employ of the Farrel Foundry & Machine Co. as a machinist's apprentice. After serving his apprenticeship for three years he worked as a machinist for two years, then entered the drafting room of the Farrel Company. During the next ten years his exceptional ability as an engineer led to his appointment as chief engineer, a position which he held until 1930, when he was elected vice-president, in charge of engineering. In July, 1933 ill health compelled him to relinquish active direction of engineering, when R. A. North succeeded him as chief engineer, and Mr. Bowen became consulting engineer, continuing also as vice-president until his death.

✦ ✦ ✦

MR. Bowen had been a member of the American Society of Mechanical Engineers since 1899 and was affiliated with the Masonic order and with the Ansonia lodge of Elks. He took an interest in civic and community affairs, serving as alderman of Ansonia and member of the board of trustees of the Ansonia Public Library. He was also a vestryman of Christ Episcopal Church. He is survived by his wife, a son, daughter and two grandchildren.

'Round the World With the Wire Industry

German Notes

THE export business in wire products during the past month had been comparatively satisfactory. During the last week of November and first half of December orders from China, Brazil, Argentine, Africa, etc., were rather heavy, but in the third week of December business declined, as Japan, which has been for a long time out of the market has re-entered the field and is now again competing. The Japanese prices are low and the IWECO has been compelled to lower the quotations for export to the Far East and certain Near East markets. The general outlook for the business in 1935 is however satisfactory.

✦ ✦ ✦

THE International wire rod cartel has fixed the allotment for the first quarter of 1935 at 350,000 tons which is an increase of approximately 30,000 tons compared with the allotment for the last quarter of 1934. The increase is possibly due to the improvement on the export markets. The prices are also firmer, as the cartel is now purchasing the Polish export quantities and avoids thereby the competition of the Polish industry. This does not mean that Poland is entering the cartel. The present quotations of the cartel vary between £ 4.7.6 and 4.10 (b gold). The competition of the American industry is not heavy. Japan has bought 12,000 tons.

✦ ✦ ✦

BARTER trading in wire products is taking an increasing percentage of the total business from month to month. Now also barter orders were closed with Mexico, Columbia and California (against citrus fruits and apples). The big contract with S. Africa includes 2600 tons of German wire products and negotiations are pending as regards barter business also from Australia, in exchange against wool and other country products. Negotiations have already been brought to a preliminary agreement.

✦ ✦ ✦

JAPAN has placed a number of rush orders for wire machinery as substituted for the machines which had been destroyed by the Taifun in September. The value of these orders exceeds $400,000.

✦ ✦ ✦

REPORTS that the IWECO has been negotiating with the Canadian industry as regards business with Great Britain were not confirmed. The Canadians are supplying England with increasing quantities of wire nails and an agreement was proposed, that

(*Please turn to page 78*)

MICRO-WELD
Trade Mark Reg. U. S. Pat. Off.

Micrometer Precision Electric Welders

The patented indexed dials, found only on Micro Welders, assure rapid adjustments with micrometer precision . . . Under the most severe conditions of service, or high speed, you can count on Micro Welders doing a consistent and uniformly high grade welding job . . . That's why more and more wire manufacturing and fabricating plants are installing Micro Welders.

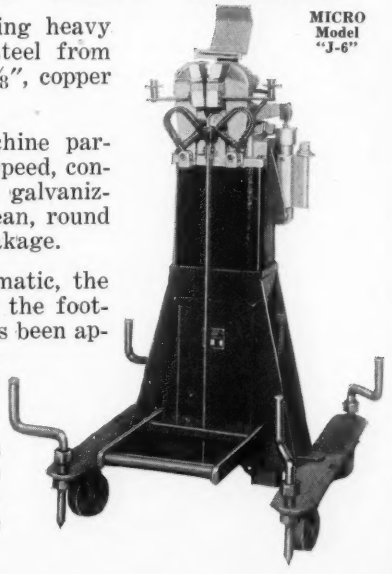
MICRO AUTOMATIC BUTT WELDER

A precision-built machine for welding heavy gauge rods of various materials—steel from ¼" to ½", aluminum from ¼" to ⅜", copper from ¼" to 5/16".

Automatic features make this machine particularly effective for use with high speed, continuous operations, such as drawing, galvanizing and tinning equipment where clean, round welds are necessary to eliminate breakage.

The current control is entirely automatic, the operating switch being contacted by the foot-pedal action, after proper pressure has been applied. An adjustable limit switch cuts off the current just before the weld is completed.

Its fast action and automatic features make this a most practical machine for stranding, spooling and fabricating operations in wire mills and wire working plants.



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'Round the World With the Wire Industry

West India should be left by the IWECO entirely to Canada and Canada would leave England to the IWECO. However it seems that the negotiations were not successful.

✦ ✦ ✦

THE German wire rope cartel has been entirely reorganized and the outsiders cartel has been amalgamated with the original cartel. The export trade in wire ropes is further improving and the German cartel is now exporting 25% greater quantities than last year. The export trade in cables and electric wires is 15-20% better than last year, also due to barter contracts.

✦ ✦ ✦

Japanese Nail Imports

SHARP pointed nails are used in Japan as against those with the semi-blunt point for which no market appears to exist. During 1933, this type of nail was imported to the extent of 773,300 kin valued at 367,000 yen, the chief sources of supply being Sweden, 393,200 kin valued at 169,000 yen, and the United States, 270,600 kin valued at 158,000 yen. Those totals also approximated those of the previous year.

✦ ✦ ✦

New Small Pipe and Tubing Plant

SALE of the former bolt factory of the Ulster Iron Works in West Clinton Street was announced by Frank W. Hamilton, president of the company. The property was bought by J. A. Williams of Rochester.

✦ ✦ ✦

THE new owner will manufacture small size pipe and tubing and will employ approximately 80 men at once.

Reynolds Spring Co.

THE majority interest of W. R. Reynolds in the Reynolds Spring Company has been purchased by C. G. Munn, president and John H. Merrell of Chicago. The resignation of Wiley R. Reynolds as chairman of the board and a director has been accepted with regret. Mr. Merrell is vice-president of Raybestos Manhattan Company.

✦ ✦ ✦

RELEASES for the company's products cushion springs and plastic mouldings are the heaviest in its history, according to Mr. Munn. Both Jackson plants are operating at capacity on three shifts with employment at an all time high of 2,300.

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MANUFACTURING EXPERT

Rubber Insulated Wires and Cables. Must be thoroughly familiar all phases, including rubber chemistry. Apply Box 10, Wire & Wire Products, 17 East 42nd St., New York, N. Y.

Upright Cone Wire Drawing Machines — A Complete Line of Four Sizes

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Min. Finish No. 44 B & S
Finishing Speeds
Up To 6,000 F. P. M.

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Illustrating
No. 1 Machine - Start No. 14
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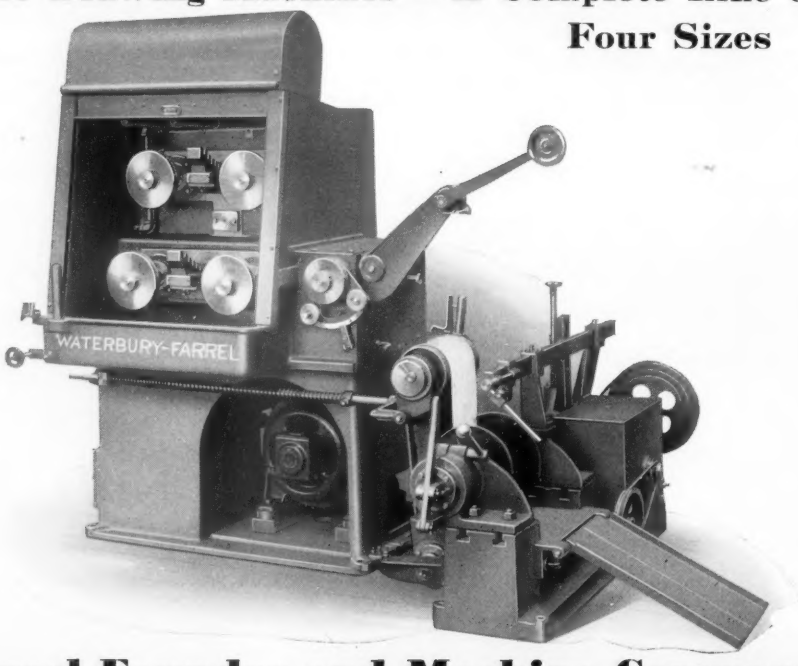

Waterbury Farrel Foundry and Machine Company

Waterbury, Connecticut

Offices
Cleveland Chicago
Philadelphia

Exports and Imports

(*Continued from page 74*)

from Czechoslovakia. A further checking reveals this to be in error and the quantity referred to should be accredited to the Netherlands making the total amount of pig iron received from that country during October aggregate 4,003 tons instead of 503 tons as reported. Structural shapes composed the fourth product of the month, and Belgium furnished 3,063 tons of the 3,328 tons received, while France participated to the extent of 227 tons. The next product of importance in the month's trade was hoops and bands registering 1,840 tons which came principally from Belgium, 1,616 tons, Germany, 105 tons, and the United Kingdom, 83 tons. The sixth product was merchant and other steel bars aggregating 1,696 tons purchased chiefly from Belgium, 1,229 tons, Sweden, 255 tons, Germany, 81 tons, and the United Kingdom, 67 tons.

CANADA was the leading supplier of iron and steel products to the United States during November by virtue of markedly increased shipments of ferromanganese and spiegeleisen, scrap and pig iron. Its aggregate participation of 17,904 tons included principally 9,428 tons of ferromanganese and spiegeleisen, 7,554 tons of scrap, and 740 tons of pig iron. The second supplier of the month — Belgium—had a more varied trade, its aggregate of 7,328 tons consisting mainly of structural shapes, 3,063 tons, hoops and bands, 1,616 tons, merchant and other steel bars, 1,229 tons, wire rods, 385 tons, and steel ingots, blooms, etc., 340 tons. The 2,539 tons of pig iron received from the Netherlands made up the larger part of that country's participation in the November trade, while the share of British India was confined entirely to 2,201 tons of pig iron. Purchases from Sweden, amounting to 1,759 tons placed that country in the position of the fifth most important supplier for the month, its participation embracing chiefly 460 tons of wire rods, 376 tons of pig iron, 255 tons of merchant and other steel bars, 197 tons of flat wire and strip steel, 158 tons of round iron and steel wire, and 98 tons of 'other pipe'. Germany followed with a total of 1,220 tons composed chiefly of 375 tons of nails, tacks, and staples, 195 tons of barbed wire, 150 tons of rails and rail fastenings, 105 tons of hoops and bands, and 88 tons of 'other pipe'.

✦ ✦ ✦

CARD Clothing receipts — 7,589 square feet valued at $11,433 declined by 1,378 square feet and $2,624 under the earlier month, and were supplied by the United Kingdom, 7,219 square feet valued at $11,248, and Germany, 370 square feet valued at $185.

✦ ✦ ✦

WIRE cloth and screening receipts which had been following a downward trend over the past several months took a turn in the other direction, the 71,377

(*Please turn to page 80*)

THE DETAILED DISCUSSIONS

At The

WIRE ASSOCIATION MEETINGS

Held At New York, October 1-5, 1934

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✦ ✦ ✦

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RICHARD E. BROWN, Secretary

THE WIRE ASSOCIATION 17 E. 42nd St., New York, N. Y.

Exports and Imports

(*Continued from page 79*)

square feet received registering a gain of 45.6 percent over the previous month. The November total came from Germany, 35,530 square feet, Canada, 29,599 square feet, France, 5,068 square feet, the Netherlands, 988 square feet, and Sweden, 192 square feet.

✦ ✦ ✦

WIRE fencing and netting galvanized before weaving receipts amounts to 256,425 square feet—contrasted with no imports last month—and originated in Belgium, 236,425 square feet, and the Netherlands 20,000 square feet. Of the galvanized after weaving, the 656,700 square feet received represented a gain of 172.8 percent over last month and was supplied by Belgium, 294,450 square feet, and the Netherlands, 362,250 square feet.

✦ ✦ ✦

A GAIN of 114.3 percent was registered in receipts of fourdrinier and other papermaking wires, the aggregate of 66,769 square feet coming from Austria, 50,596 square feet, Germany, 8,-181 square feet, France, 6,730 square feet, and Sweden, 1,262 square feet.

✦ ✦ ✦

A CONSIDERABLE gain was recorded in wire heddle receipts, the 604,000 pieces—all from France — rising 578,000 pieces above October imports.

✦ ✦ ✦

EXPORTS of iron and steel wood screws during November, 1934 totalled 13,757 gross, valued at $2,-093. Of this total Cuba took 5,-534 gross, valued at $665; Venezuela 1,500 gross valued at $145; Mexico 1,324 gross valued at $274; Colombia 920 gross valued at $96; Honduras 762 gross valued at $224.

✦ ✦ ✦

EXPORTS of brass wood screws during the same period totalled 5,506 gross, valued at $1,987. Of this amount Panama took 1,920 gross valued at $697; Cuba 1,185 gross valued at $359; Hong Kong 666 gross valued at $285; Netherland West Indies 455 gross valued at $226; Philippine Islands 335 gross valued at $87.

✦ ✦ ✦

IMPORTS of wood screws during the same period amounted to 33,443 gross, valued at $5,818, of which Belgium supplied 18,250 gross valued at $2,806, and Sweden 14,828 gross valued at $2,945.

✦ ✦ ✦

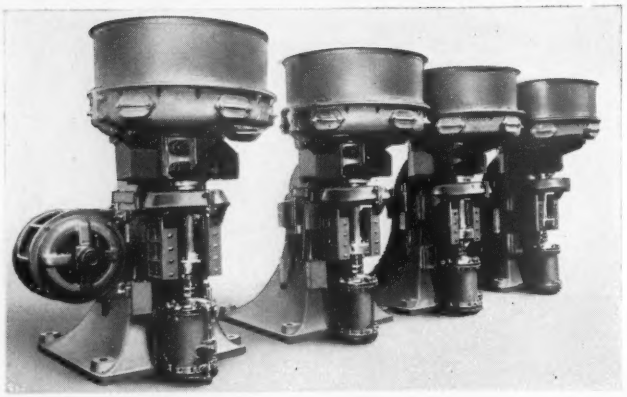
Amendment to Wire, Rod, and Tube Die Industry Code Approved

APPROVAL of an amendment to the code for the wire, rod, and tube die industry, allowing overtime in hours of work during peak seasons, was announced by the National Industrial Recovery Board.

✦ ✦ ✦

THE amendment reads: Amend Article III, Section 1, by adding the following: "However, during peak seasons employes may be permitted to work not more than 44 hours in any week (of five working days) for not to exceed four weeks in each six-months' period, provided all hours worked by an employe in excess of those hereinbefore in this section prescribed shall be paid for at one and one-half times his normal rate of pay."

FARREL ROD COILERS



for rounds or flats

Farrel Rod Coilers are built in two types—the plate lifting type for round rod, and the retracting pin type for flat or rectangular sections.

Both types have modern features of design and construction which assure dependable, efficient operation, with minimum maintenance.

- All moving parts are enclosed for safety.
- Silent chain drive and cut bevel gears are fully enclosed and run in oil.
- All shafts are mounted in anti-friction bearings.
- Bearings are lubricated by Alemite fittings grouped in a single block on the front of the machine, with leads to each bearing.
- Variable speed motor is mounted on adjustable bracket attached to base of machine to provide adjustment for chain drive.
- Plate lifting or pin retracting mechanisms are operated by air.

We are prepared to furnish individual coilers or complete coiler installations with centralized control desk, unloading mechanisms, conveyors, etc. For further information please address

FARREL-BIRMINGHAM
Company, Inc.
38 Main St., Ansonia, Conn.

Some Hazards in Wire Mill Operations

(*Continued from page 63*)

Paton, foreman of the Tool Department; and Arthur Smith, foreman of the Automatic Screw Machine Department. This Committee has been in existence a long time. They meet with the Superintendent of the plant every month or so and have their own meetings more frequently. To maintain a direct contact with employees, two members from each of about 50 departments are working with them as a "Worker's Committee". These appointments rotate quarterly, so that in the course of time most of the key men of the plant have had their turn The Worker's Committee invites suggestions from employees and they are continually on the lookout for hazards which, if found, are corrected at the earliest possible moment.

✦ ✦ ✦

A STUDY of their accident files reveals that back in 1924 they had a total of 75 lost-time accidents, averaging more than six a month. How these accidents have been scaled down over the decade is shown in most interesting fashion by the following table:

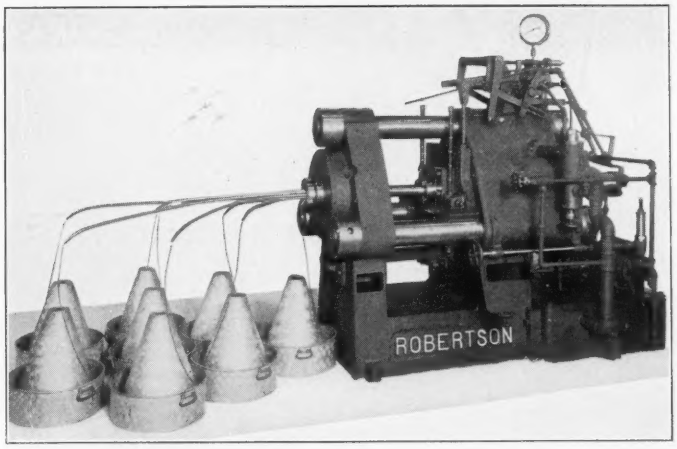
Year	L. T. A.
1924	75
1925	73
1926	18
1927	10
1928	2
1929	6
1930	2
1931	2
1932	0
1933	0
1934	0

✦ ✦ ✦

A CALM, earnest, educational appeal is carried on continuously, with posters, bulletins and the conventional attention-getters, supplemented by the best of mechanical protection.

This record would indicate that accidents in industry are avoidable and that through application of reasonable diligence, supplement-

(*Please turn to page 82*)



A Versatile, Self-contained *EXTRUSION PRESS*

---by ROBERTSON

A Satisfied Customer Writes:

"We are pleased to advise you that our extrusion press went into service very shortly after delivery and has performed splendidly ever since. We have gradually gotten into the manufacture of first, our regular shapes, then leadwire and lastly, several new shapes increasingly difficult. No real trouble has been encountered in the performance and running of this machine."

This 250-ton Robertson horizontal extrusion press is especially efficient for the extrusion of small quantities of rods, tubes and miscellaneous shapes of lead, tin, Brittania metal and other soft alloys. It occupies a floor space of only 4 ft. by 6 ft. and is entirely self contained.

The action of the press is semi-automatic; that is, after setting the lever in starting position, the press goes through its extrusion cycle and then returns to its original position, with no further attention needed.

In the photo above, this press is shown extruding eight separate strands of solid solder wire. **Note**—When extruding rosin core solder wire, only one strand is extruded.

Send for full particulars.

Robertson equipment includes: Lead-encasing Presses for Electrical Cable and Rubber Hose Manufacturers—Extrusion Presses for Lead Pipe, Lead Traps, Solder and Lead Wire, Sheet Rolling Mills, Hydraulic Pressure Pumps, Hydro-pneumatic Accumulators.

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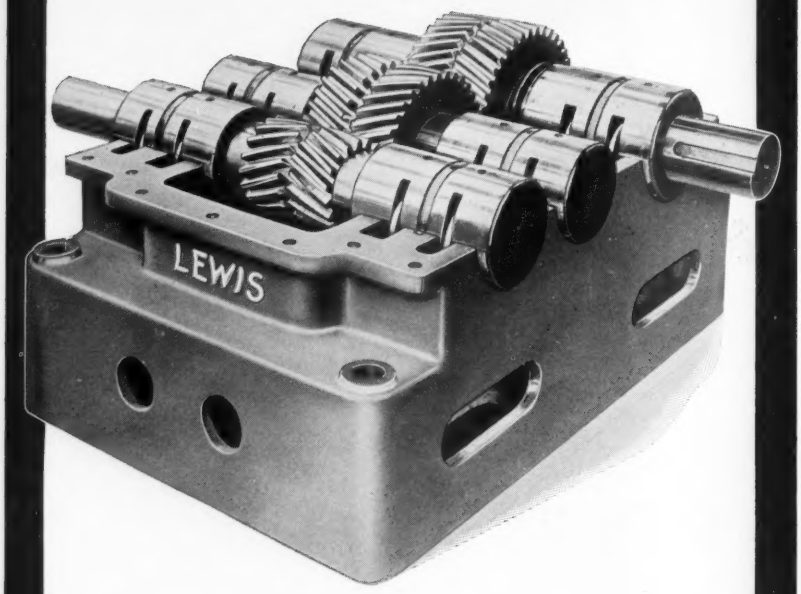

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Lewis gear housings are of two piece type with special alloy forged steel herringbone cut tooth gears running in babitted shell type or roller bearings. One Lewis gear set is used for driving two roll stands which is a special feature for controlling roll speeds when driven by either individual motors or bevel gear drives. Lewis gear sets are totally enclosed and gears and bearings run continuously in oil.

Lewis Engineers will gladly cooperate with you in designing special machinery to meet your problems.

LEWIS

PITTSBURGH, PA.

LEWIS FOUNDRY & MACHINE CO.

Some Hazards in Wire Mill Operations

(*Continued from page 81*)

ed by adequate mechanical safeguarding and inspired by a well rounded program of safety activities they can be stopped.

✦ ✦ ✦

The Pickling Solution for Rods

(*Continued from page 67*)

inhibitor is manufactured free from the foaming compound. It is often necessary to add foam to the bath when no inhibitor is needed; and when the foaming inhibitor is in use, both foam and inhibitor must be added. Thus it can readily be seen that the rod in the tub soon becomes "over inhibited." Of course a foaming compound of some sort always accompanies non-foaming inhibitor in a separate container, because foam on a pickling bath is practically indispensable. Foam on the pickling bath saves acid by keeping the fumes in the solution. It also saves expensive equipment from corrosion, and it certainly does make the condition more bearable for the operators. Foaming compounds have their disadvantages. One of the most important is the fact that it is difficult to wash off; and if not washed off thoroughly, it gives the wire a dull color after drawing.

✦ ✦ ✦

THIS discussion of the Cleaning House is merely a brief outline of the work that is being carried on, and of that which will be done in the future; and it is the hope of this writer that others interested in pickling will add their opinions through these pages.

✦ ✦ ✦

Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

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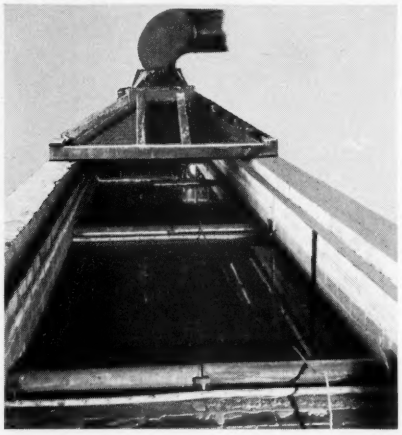
New York City



Badly worn granite bars, directly under the fume hood, after only two years service.

Thompson Wire Company Uses DURIRON

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MANUFACTURERS
COLD ROLLED STRIP STEEL - ROUND AND FLAT WIRE
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December 13, 1934

The Duriron Company, Inc.
Dayton, Ohio

Attention of Mr. D. Augsburger

Gentlemen:

We are pleased to report that the Duriron saddles and bars which we installed in July of this year, as well as the two trial saddles installed in February, have shown no signs of corrosion or wear in our sulphuric acid cleaning vat.

If the useful life of these saddles is proportional to the service which they have given in the past ten months, we shall feel that the saving effected by the substitution of Duriron for granite will more than justify the investment.

Very truly yours,
THOMPSON WIRE COMPANY
TP:MAS
Thurlow Packard

Read this letter from Mr. Packard

Duriron saddles and bars replaced granite bars. For abrasion and corrosion resistance, Duriron is again making a name for itself.

Duriron equipment might help you solve a corrosion problem. An inquiry doesn't obligate you at all. Write

The Duriron Company, Inc.
442 N. Findlay St., Dayton, Ohio

The Manufacture of Welding Electrodes

(*Continued from page 68*)

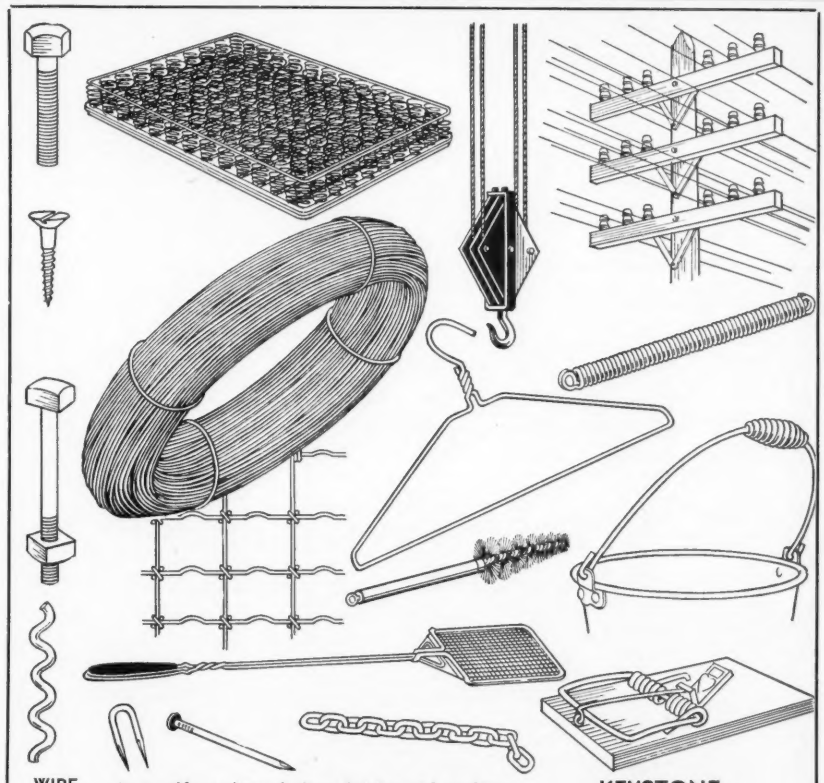
Coating the Electrodes

THE coating of the electrodes with flux is accomplished on an extruder, shown in Fig. 3. The electrodes are placed in a hopper on top of this machine from which they pass through a die and receive the coating of flux. The latter is forced through the die by a ram operating in a cylinder. In this case, also, the diameter of the electrodes determines the speed at which they may be efficiently coated, and in addition to this, electrodes call for various thicknesses of coating according to the conditions under which they are to be used, which has a bearing on the speed at which they may be coated. An example of this is that electrodes of 3/32 in. diameter may be coated at the rate of 160 per minute and those of 3/16 in. diameter at only eighty to one hundred per minute. Consequently accurate speed control between these limits is very necessary. As will be seen from the illustration the motor and the variable speed control unit are placed under the machine to regulate the rate of feed of the electrodes through the die.

✦ ✦ ✦

Control of Flux in Die Cylinder

THE rate of flow of the flux through the die cylinder is



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General Offices TROY, N. Y. Laboratories

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FOR CARBON STEELS ▲ ▲ ▲

The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

DELANY CHEMICAL CO.

COTTMAN AND MILNOR STS.,
PHILADELPHIA, PA.

The Manufacture of Welding Electrodes

(*Continued from page 83*)

controlled by another variable speed unit as shown in Fig. 4. That is, the rate of flow of flux is synchronized with the feed of the electrodes through the die in this manner. Texrope drive is used between the constant speed motor and the variable speed transmission, the variable speed shaft of the latter being connected by a one to one chain to a gear transmission. This is connected to a thirty-six to one reducer through a 21 tooth to 30 tooth sprockets on a 6 pitch head. By this means the range of one to one to five to one is provided for. The motor which is associated with this variable speed arrangement is the one shown in the foreground of Fig. 4.

✦ ✦ ✦

Drying

AS the electrodes pass from the die, with their coating applied, they drop on to a belt conveyor carrying them through a dryer. The speed of this conveyor must also be varied, depending on the rate of operation of the extruder and the length of time needed to dry coatings of different thickness and diameters. This also is controlled by means of variable speed units in the conveyor drive.

By Arrangement With The Manufacturers' Committee of
Reels And Spools Standardization

Reprints of the report of this committee as published in the November, 1934, issue of WIRE & WIRE PRODUCTS, outlining the proposed new standards for reels and spools for insulated wire and cable can be obtained for 25c a copy from

Wire & Wire Products
17 East 42nd St.
New York, N. Y.

Wire Drawing--Single and Multiple Drafting

(*Continued from page 73*)

draft when drawing 0.65 per cent carbon and upwards before proceeding to second draft, eliminates possibility of fatigue, interval elapsing between drafts enabling material to recuperate from strains set up by previous drafting. Whilst no change is apparent in crystalline structure apart from finer grain, easier slip or reaction of material to drawing operation after rest interval proves that a change does take place, and no better method of obviating this condition has so far been discovered.

✦ ✦ ✦

DEFECTS set up in high carbon material by continuous drawing are various, and have been the subject of extensive research. With the increasing development of the metallic or ready set die this research has resulted in many improvements, notably in the direction of keeping die cool during drawing operation.

✦ ✦ ✦

RAPID heating of metallic dies when tested with hard drawn high carbon material and resultant spoilation has led to many new ideas in cooling methods. Cooling by a system of water circulation through die boxes, and cooling of material on drum after reduction by forcing water into drum interior are two of the latest, and in the case of the latter it is claimed possible to draw high carbon material by the continuous process free from fatigue or torsional defects.

✦ ✦ ✦

FROM a productive point of view the steel die with its greater bulk of metal certainly appears more efficient in absorbing and spreading heat generated, and the fact that a larger output can be drawn with an hole in an 18 hole die, than one in the single hole type, certainly leads to the assumption of this theory. The 18 hole type with its larger bulk, has a greater area for the absorption of the heat generated.

(*Please turn to page 86*)

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

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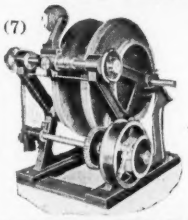
MAGNET-WIRE ENAMELING MACHINES, COTTON, SILK, ASBESTOS, PAPER AND OTHER TAPE, WIRE INSULATING MACHINES.

(7)



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Complete Wire Tinning and Wire Electro-Plating Outfits. Wire Saturating Equipment. Wire-Respooling, Coiling and Wire-Reclaiming Machines. Automobile-Cable and Pressure-Hose Armoring Machines.

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Also Galvanizing and Tinning furnaces and take-up frames, Annealing and Pickling Equipment.
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FOSTORIA, OHIO.

Wire Drawing

(*Continued from page 85*)

A FEATURE which die makers have apparently overlooked in the construction of ready set dies for dry drawing, is the longer lead to bearing in steel dies which, due to thickness of metal, ensures more efficient lubrication. With this extra length of hole or lead the lubricant carried over by passage of the wire is first compressed, then forced into pores of material by force generated. No such provision is provided in the metallic die.

✦ ✦ ✦

EARLIER, mention was made of the "overdrawn" condition. This can be present even when bend and torsion test fail to reveal, and a good plan to find condition of hard wire for further reduction is to immerse sample in boiling water for three minutes. Remove at the end of this period and allow to cool, then torsion against sample taken from coil. If overdrawn, number of twists in treated sample will be found to be lower than those of sample taken from coil, and degree of condition can be estimated from proportional difference in number of twists.

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With
FLYING SHEAR
for round and shaped wire.
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For Wire, Rod and Tubing
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For more complete information, consult the annual Directory, Index & Buyers' Guide.

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ANNEALING FURNACES
See Furnaces—Various Headings

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Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

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Vaughn Machinery Co., Cuyahoga Falls, O.

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CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Grasseli Chemical Co., Cleveland, O.

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Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

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COILERS—Sheet, Strip and Wire
Borden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

COPS—Paper
Manning Paper Co., John A., Troy, N. Y.

CRANES—Wire Mill
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Diamond
Association of Wire, Rod and Tube Die Mfgrs., Inc., New York, N. Y.
Ballotfet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., N. Y.

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Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Bissett Steel Co., Cleveland, O.
Kelly Wire Die Corp., New York, N. Y.

DIES—Tungsten Carbide
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Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
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Vianney Wire Die Works, New York, N. Y.

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Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

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Electric Furnace Co., Salem, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.

FURNACES—Wire, Strip and Sheet
Electric Furnace Co., Salem, O.

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Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis Foundry & Machine Co., Pittsburgh, Pa.

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Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
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Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

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Watson Machine Co., Paterson, N. J.

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Vaughn Machinery Co., Cuyahoga Falls, O.
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MACHINERY—Magnet Wire
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MACHINERY—Measuring Wire & Cable
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

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Broden Construction Co., Cleveland, O.
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Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

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Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
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Lewis F'dry & Machine Co., Pittsburgh, Pa.

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Lewis F'dry & Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

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New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

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Farrel-Birmingham Co., Inc., Ansonia, Conn.
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Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

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Sleeper & Hartley, Inc., Worcester, Mass.

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Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Fidelity Machine Co., Philadelphia, Pa
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

MATERIAL HANDLING EQUIPMENT—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PAPER—Insulation
Manning Paper Co., John A., Troy, N. Y.

PAPER—Packaging (For Wire Cable)
Manning Paper Co., John A., Troy, N. Y.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelph'a, Pa.
Grasselli Chemical Co., Cleveland, O.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Inc., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLING MILLS—See Machinery—Rolling Mill

ROLLS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Republic Steel Co., Youngstown, O.
Superior Sheet Steel Co., Canton, O.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Co., Youngstown, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Enameled For Coils
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Continental Steel Co., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.

WIRE—Non Ferrous to Specification
Hudson Wire Co., Ossining, N. Y.
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

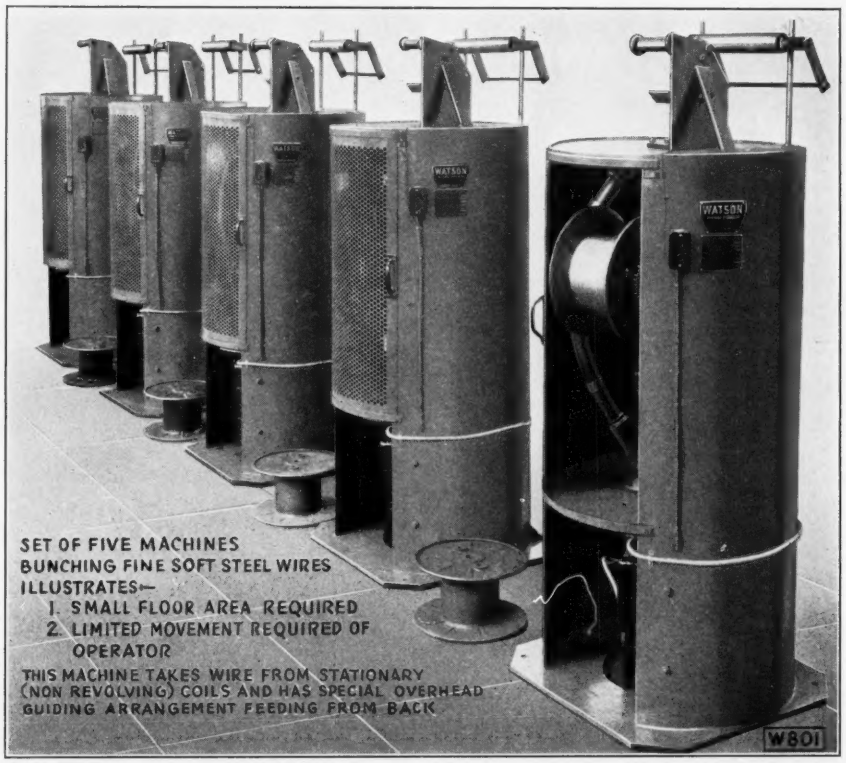
This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

The Watson Machine Company

ESTABLISHED 1845

Paterson, New Jersey, U. S. A.

Engineers - Founders - Machinists

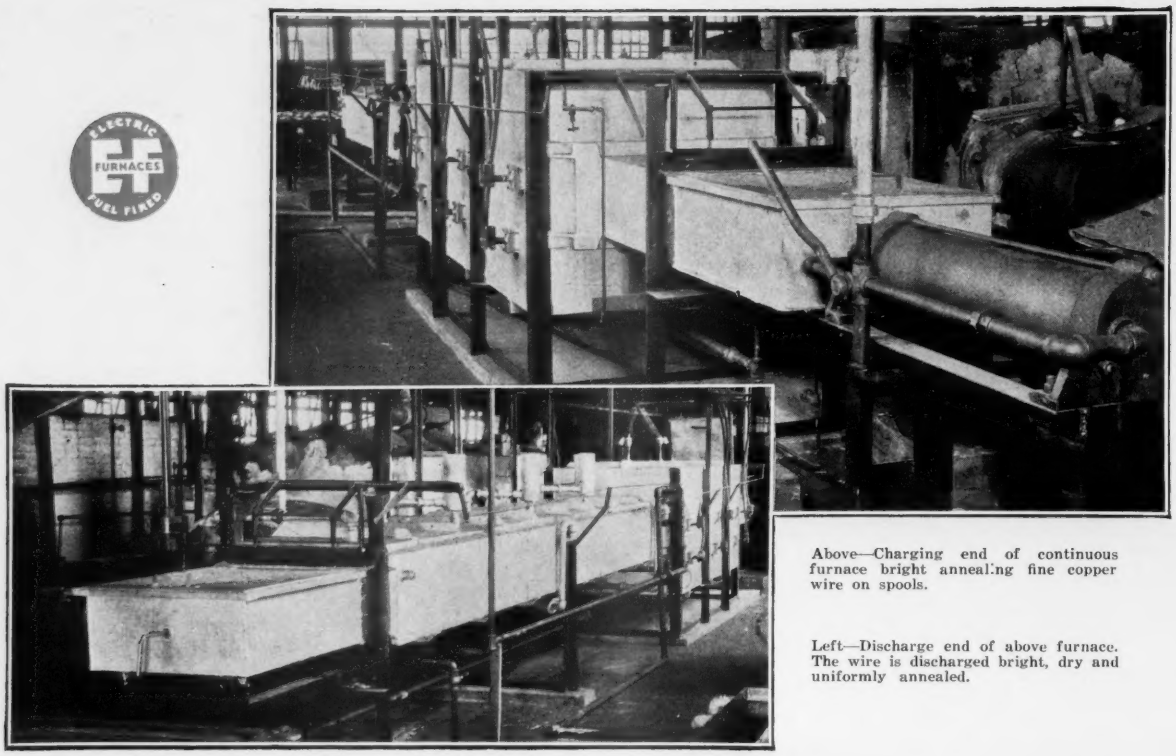

SET OF FIVE MACHINES
BUNCHING FINE SOFT STEEL WIRES
ILLUSTRATES—
1. SMALL FLOOR AREA REQUIRED
2. LIMITED MOVEMENT REQUIRED OF OPERATOR
THIS MACHINE TAKES WIRE FROM STATIONARY (NON REVOLVING) COILS AND HAS SPECIAL OVERHEAD GUIDING ARRANGEMENT FEEDING FROM BACK
W801

A modern high capacity installation of five WATSON BUNCHERS V7 for fine wire bunching, for single operator is shown above.

At 1″ lay 42,000 feet of strand is produced hourly.

Small floor area, and automatic electric stops enable single operator to take care of eight machines with ease.

Send for latest bulletin and prices.



Above—Charging end of continuous furnace bright annealing fine copper wire on spools.

Left—Discharge end of above furnace. The wire is discharged bright, dry and uniformly annealed.

Bright Annealing Copper Wire

Uniformly, Economically, Continuously,--Bright and Dry

No steam, vapor or water seals of any kind are used in the continuous, controlled atmosphere furnace shown above—thus staining is entirely eliminated and no drying necessary,—the wire is delivered from the furnace uniformly annealed, bright and dry; ready for shipping, further processing or fabricating. This is one of several new types of electric and fuel-fired furnaces we developed and built for the wire industry —both ferrous and non-ferrous.

Other recent installations include furnaces for clean annealing brass wire—an improved pit type furnace for normalizing and annealing steel wire in coils, and furnaces for scale free hardening, billet heating, bright annealing, brazing, carburizing, and other heating and heat treating processes.

If you are interested in improving the quality of your anneal or heat treatment; increasing production or contemplating any changes or additions to your furnace equipment, our engineers will be glad to work with you. We specialize on building furnaces to fit the customer's particular problem.

We Build the Furnace to Fit Your Job---For Oil, Gas or Electric Heat

The Electric Furnace Co., Salem, O.

Head Office and Works of The Electric Furnace Company, Salem, Ohio . . . located on the main line of the P. R. R. . . . the largest plant in the country devoted exclusively to designing and building industrial furnaces and auxiliary equipment.